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The ST. LAWRENCE SEAWAY

ITS IMPACT, BY 1965, UPON INDUSTRY OF METROPOLITAN CHICAGO AND ILLINOIS WATERWAY-ASSOCIATED AREAS

VOLUME 1

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VOLUME 1

The ST. LAWRENCE SEAWAY

ITS IMPACT, BY 1965, UPON INDUSTRY OF METROPOLITAN CHICAGO AND ILLINOIS WATERWAY-ASSOCIATED AREAS

By:

Joseph A. Russell

Jerome D. Fellmann

Howard G. Roepke

STATE OF ILLINOIS

William G. Stratton, Governor

Department of
Registration and Education
Vera M. Binks, Director

Division of Industrial
Planning and Development
Richard Nowinson, Chairman
James F. Cannon, Superintendent

CHICAGO ASSOCIATION OF
COMMERCE AND INDUSTRY

Paul W. Goodrich, President

Thomas G. Ayers, Vice President
for Industrial Development

Thomas H. Coulter,
Chief Executive Officer

Charles F. Willson, Director
Industrial Development Division

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PREFACE

This report—on the impact by 1965 of the improved St. Lawrence Seaway and the Illinois Waterway upon the economic structure of the Chicago Area and of parts of Northern Illinois —has been prepared at the request of the Chicago Association of Commerce and Industry and of the Division of Industrial Planning and Development of the State of Illinois. That request expressed the conviction of responsible officers of both agencies that neither extreme pessimism nor optimism was a satisfactory basis for local or state-wide economic planning. They asked that an objective appraisal be made of the kinds of economic change that might result most immediately from the opening of the improved Seaway; their interest was particularly directed toward the identification of those economic activities most likely to expand quickly or to initiate new operations within the study areas. This report, the authors hope, will provide that kind of appraisal.

To be of maximum utility, this study needed to be available early in the period of anticipated economic adjustment. The time limitations thus imposed upon, and accepted by, the authors precluded the kind of detailed and intensive investigation which they would have desired. Rather, they had to confine themselves to a general summarization of the changes most likely to occur in, particularly, Chicago's industrial structure and they have been able to treat specifically, only the more important types of industries and non-manufacturing activities.

Fortunately, they could draw upon existing volumes of information already available on the physical aspects of the Seaway, on the Port of Chicago and its facilities, and on various aspects of Seaway-associated urban planning. These sources have been used intensively and have been cited both in the terminal bibliography and throughout the report. In particular, some of these earlier studies have been helpful in Seaway traffic estimates; others have made it unnecessary for the authors to engage in industrial site analysis. Special mention must be made of the work of Professor Harold Mayer of the Department of Geography, University of Chicago.

On a more personal note, the writers wish to express their appreciation for the splendid encouragement given them by Mr. Thomas H. Coulter, Chief Executive Officer of the Chicago Association of Commerce and Industry and by Mr. Richard Nowinson, Chairman of the Advisory Board of the Illinois Division of Industrial Planning and Development. Their interest and suggestions initiated this study; their respective organizations supported it.

Gratitude is also due a list, too long to reproduce here, of individuals who gave willingly and helpfully of their time and knowledge during the research phase of this project. Members of the Chicago Department of City Planning, economists and officials of the financial institutions of the city, and staff members of the Chicago Association of Commerce and Industry are a few among the many whose contributions were indispensable to this study.

Although the authors accept full responsibility for the statements and conclusions within this report, they did not work unassisted in its preparation. Essential tasks in both research and presentation were undertaken by the following members of the Department of Geography of the University of Illinois, whose contributions are gratefully acknowledged: Mr. James A. Bier, Cartographer, and his staff —Holly W. Byrne, Byron Daugherty, and Ray S. Fukumoto; special research assistants within the Department of Geography—Robert Altschul, John R. Bernick, Charles F. Heller, R. James Heyl, Robert W. Latta, Herbert Slutsky, James A. Taylor, and Donald F. Vollbracht; and the secretarial staff of the Department—Miss Gladys Hollingshead and Miss Dorothy D. Coslet. Special, and indispensable, secretarial assistance was given by Mrs. Ruth A. Roepke.

Because of the complexity of the task facing the authors—and of the short time available to them for it—they requested that an Advisory Group be formed of business executives, economists, planners, and officials actively concerned with the Port of Chicago. This group, meeting frequently with the authors, made available to them a breadth of knowledge and experience they could not themselves supply. The services of the following—all members of

the Advisory Group—are gratefully acknowledged, though no blame should fall upon them for the use or misuse the authors made of their valuable contributions:

Thomas G. Ayers, Vice President
Commonwealth Edison Co.
Chicago, Illinois

Ira J. Bach, Commissioner
Department of City Planning
Chicago, Illinois

James F. Cannon, Superintendent
Division of Industrial Planning and Development
State of Illinois
Springfield, Illinois

Maxim M. Cohen, General Manager
Chicago Regional Port District
Chicago, Illinois

Thomas H. Coulter, Chief Executive Officer
Chicago Association of Commerce and Industry
Chicago, Illinois

Chester R. Davis, Senior Vice President
Chicago Title & Trust Company
Chicago, Illinois

Bruce Dwinell, Vice President
Chicago, Rock Island & Pacific Railroad
Chicago, Illinois

Fred A. Gerding, Chairman of the Board
First National Bank of Ottawa
Ottawa, Illinois

J. J. Harrington, Jr., Partner
J. J. Harrington & Co.
Chicago, Illinois

Stanley G. Harris, Jr., Vice President
Harris Trust & Savings Bank
Chicago, Illinois

W. W. Huggett, President
North Pier Terminal Company
Chicago, Illinois

Robert C. Humphrey, Vice President
Commercial National Bank of Peoria
Peoria, Illinois

Eugene Landis, Director of Transportation
International Minerals & Chemicals Corporation
Skokie, Illinois

Capt. John Manley, Port Director
Department of the Port of Chicago
City of Chicago
Chicago, Illinois

Richard Nowinson, Chairman of Advisory Board
Division of Industrial Planning and Development
State of Illinois
Chicago, Illinois

Alex A. Scherer, President
Scherer Transportation Co.
Ottawa, Illinois

Arthur H. Schwietert, Director
Transportation Division
Chicago Association of Commerce and Industry
Chicago, Illinois

DeVer Sholes, Director
Business Research and Statistics Division
Chicago Association of Commerce and Industry
Chicago, Illinois

SECRETARY

Charles F. Willson, Director
Industrial Development Division
Chicago Association of Commerce and Industry
Chicago, Illinois

Professor Alfred W. Booth, Department of Geography, University of Illinois, contributed much to the study during its early stages. Traffic estimates and other aspects of the complex transportation problems created by the opening of the Seaway were his special responsibility. A prior committment necessitated his absence from Urbana during the time the report was written.

Joseph A. Russell
Jerome D. Fellmann
Howard G. Roepke

Department of Geography
University of Illinois
Urbana, Illinois
September 1, 1959

INTRODUCTION

The St. Lawrence Seaway has been thought by many to possess a magical ability to transform the dreams of Industrial Development Committees into gleaming new factories and increased employment. In vast variety and enormous quantity, raw materials would flow over the Seaway to the busy plants, and manufactured goods would be carried cheaply and sold easily in the waiting world markets.

These dreams of new wealth seemed nearly guaranteed by the agricultural and industrial riches already existing in the American Midwest. The Great Lakes border the most productive agricultural land in the world. The interior of North America possesses minerals in abundance: coal, oil, iron ore, copper, salt, fluorspar, sands, and clays. The huge accumulations of industry in the area are among the most efficient and diverse in the world. These resources and industries in the past have been focused on a virtually land-locked Lakes system; certainly when the new accessibility of the area to the materials and markets of the whole world is created by the opening of the improved Seaway, the dreams of industrial expansion seem plausible.

But plausible dreams are not practical realities, and the impact of the improved Seaway upon existing major economic concentrations along the Lakes may, regrettably, prove less than the more enthusiastic proponents of Seaway transportation have envisioned.

We are concerned in this report, however, not with dreams but with as realistic an assessment as possible of the specific effects of the St. Lawrence Seaway and Illinois Waterway improvements upon an existing huge, complex, and dynamic economic unit—the Chicago Standard Metropolitan Area and upon the parts of Illinois that are adjacent to the Illinois Waterway.

Chicago, of course, is not an isolated entity; it is the heart of a continuous belt of intensive industrial and commercial development extending from mid-Wisconsin around the southern end of Lake Michigan into western Michigan. A long-recognized statistical and economic unit, the Chicago Standard Metropolitan Area stands supreme within the interior of the nation in nearly every measure of manufacturing and non-manufacturing development.

Most closely associated with this dominating economic center is that part of Illinois flanking the Illinois Waterway—stretching southwestward from the Chicago Area toward the Mississippi River. Here is to be found a rapidly developing linear pattern of industrial and commercial activity—an area tied to Chicago primarily by a network of railroads, but also merging economically with it along the connecting link of the Illinois Waterway itself.

The Chicago Area and the Waterway-associated counties of Illinois are the regions of concern here. They have much in common. Both, for example, have been the product of a gradually developing superlative transportation structure. Chicago, of course, is the classic transportation center. World famous for the rapidity of its growth during the Nineteenth Century, Chicago almost leaped into major-city status by 1845, even before a canal provided an economic connection between the

Great Lakes and the Mississippi River system. The early Lakes trade of the city was phenomenal; its growth was assured as it emerged as a primary regional capital—the principal collecting and distributing center for the goods produced or needed on the developing agricultural frontier of the American interior. To Chicago, too, came more trunk line railroads than to any other American—or world—center. Added were the barge tows on the Illinois Waterway, the small ocean-going ships traversing the St. Lawrence River and its old lock system and the Great Lakes, the highways that were to make the city the leading truck terminal of the nation, and finally, the oil and gas pipelines and the airlanes. Each was attracted by the incomparable complex of economic activities built upon a base bequeathed by its predecessors. Each, in its turn, contributed to the growing functional complexity of the Chicago Area.

Similarly, though less spectacularly, the area along the Illinois Waterway has also developed under the spur of superior transportation facilities. Crisscrossed by railroads, highways, and pipelines, the Waterway-associated area has developed an imposing industrial and commercial structure only moderately dependent upon the barge route connecting the Great Lakes with the Gulf of Mexico. Rather, the Waterway has served primarily as the localizing factor in the development of a series of urban centers bound to each other and to the major Chicago complex primarily by railroad.

Even in the light of the superlative existing transportational networks serving both areas, there has been great expectation of material gain in new industries and functions from the improvements in Seaway and Waterway—even though they have been for a quarter-century a part of the areas' facilities. For Chicago, the improved St. Lawrence Seaway has promised new access to markets and raw materials of the world, while both the improved Seaway and Waterway—through their increased capacities—have been viewed as effective new competitors to land transportation media in volume of tonnage carried. Similar benefits have been expected to accrue to the Waterway-associated area.

The Organization of the Study

This report was designed to evaluate, realistically and without bias, the general and specific effects of Seaway and Waterway improvement upon the existing complex, growing, and changing economic structure of the Chicago Standard Metropolitan Area and of the Waterway-associated counties of Illinois. The economy of this area has dynamic qualities imparted to it by 150 years of growth and change, with developmental trends already in evidence prior to—and completely independent of—the opening of the improved Seaway or Waterway. The structure of this economy in its existing patterns and trends demanded analysis first, for the impact of either waterway improvement could be estimated only against the background of the economic growth and change inherent within the Chicago and Waterway-associated areas. Either alone or in combination, the total new traffic contributions of the improved waterways will be so small as to make their effects detectable—if at all—only as minor modifications of existing economic conditions and trends. For this reason, Parts I and II of this report discuss the economic backgrounds and prospects of the Chicago and Waterway-associated areas as they appear in their normal development, with Seaway and Waterway playing only their traditional minor role.

Part I discusses briefly the historical and contemporary economic structure of both the Chicago Area and of the Waterway-associated counties of Illinois. In that discussion, particular emphasis is placed upon the analysis of the employment pattern of the manufacturing and non-manufacturing sectors of their economies. That emphasis requires a word of explanation. Employment has been chosen as the main measure of relative importance of industries within the economic complex and as the principal criterion of industrial growth and decline; the choice was made for three reasons. First, no other measure of industrial activity—neither investment, value added, production volumes, nor any other—has the same meaning for the population-supporting potential of an area as does numbers employed. It is with employment, not with product, that people are

concerned; it is through employment opportunities that they will evaluate the economic prospects of the Area and judge the impact of waterway improvements upon them. Second, only employment figures give some reasonable basis for comparing the respective levels of development of different industries; differences in degree of automation, levels of labor productivity, profit margins, and other characteristics may be so pronounced as to make other measures, if not meaningless, at least misleading. Third, only employment statistics were available for the periods in which we were interested and in a form directly comparable or reconcilable from one period to the next.

Part II, building on the economic trends outlined in the historical survey, projects the observed patterns of growth of manufacturing and non-manufacturing industries to determine the probable structure of Chicago's economy in 1965. The recognition of growth trends and changes in Chicago's post-World War II economy is the indispensable starting point in estimating the extent to which a new and minor element—Seaway and Waterway improvement—may make its influence felt. The terminal date of 1965 was suggested to the authors as one sufficiently in the future to permit some evidences of Seaway impact to have developed, and near enough at hand to permit some certainty that now-operative economic trends could reasonably be projected.

Part III turns attention specifically to the St. Lawrence Seaway and to the impact of its improvement upon the general economic structure of Chicago. Of particular concern are the growth prospects of individual industrial types as a result of improvements in water transportation. Estimates of the improved Seaway's contribution to Chicago's total 1965 traffic flow are made, and some general estimates of the effect of Seaway improvement on Chicago's industrial attractiveness are offered. A survey of locational needs and industrial costs of Chicago Area industries serves as an introduction to a detailed consideration of the Growth Prospects of individual industrial types in view of Seaway and Waterway improvement.

Part IV presents a series of detailed findings which have grown out of the research undertaken for this report. These itemized findings, each with references to those text pages on which fuller discussion of the topics may be found, serve as a summarization of the organization and results of our work.

Attached to the body of this report are two Appendices: the first discusses those aspects of rate-making that are of particular pertinence to an assessment of Seaway and Waterway impact upon general and specific freight rates affecting Chicago's industrial prospects; the second reviews the several statistical techniques employed in the economic analyses basic to the study.

Volume II of this report contains material pertaining to the competitive position that Chicago and the Waterway-associated area of Illinois can offer industries, with particular emphasis on those selected in Part III of Volume I as being sensitive to waterway improvement. Included are discussions of material availability within the United States, the Western Hemisphere, and the world as well as analyses of economic and other characteristics of Chicago and the Chicago Supporting Area shown on Figure 8 of Volume I.

Special terminology.—In the body of this report, certain standardized references and terms have been employed. Our primary interest is in the Chicago Standard Metropolitan Area; to avoid needless repetition of that term, the six-county Standard Metropolitan Area will be referred to, simply, as the Area. Similarly, the term Waterway-associated area has been adopted to designate the nineteen Illinois counties, outside of the Standard Metropolitan Area, that border the Illinois River and Waterway. Any time the words Seaway and Waterway are capitalized, they refer specifically to the St. Lawrence Seaway and the Illinois Waterway, respectively.

The terminology of industrial classification also has been standardized in this report. We employ, basically, the Standard Industrial Classification of the Bureau of the Budget. That Classification's two-digit breakdowns divide all American manufacturing industry into twenty main activity groups: e.g., Primary Metal Industries, or Food and Kindred Products. It is to one of these primary divisions

that reference is made in this study when the words "group" or "industry group" are used. On the other hand, "type" or "industry type" refers to the more detailed three- and four-digit subdivisions of the various industry groups: e.g., Iron and Steel Foundries or Gray Iron Foundries (as part of the Primary Metal Industries) or Meat Products or Meat Packing Plants (under Food and Kindred Products).

Guiding Assumptions

Several general and specific assumptions were made prior to the inception of research on this report. Those assumptions, detailed below, provided a necessary framework for the investigation by limiting the number of variables that otherwise would have had to be considered. General assumptions are concerned with conditions that affect the use of the high seas, the entry of goods into the United States, and the nationwide location of industry. Specific assumptions deal with conditions that pertain to the position of Chicago in relation to the St. Lawrence Seaway and the Illinois Waterway.

General assumptions.—The authors assumed that, through 1965:

1. There would be no major war or other international catastrophe that would prevent the general use of ocean shipping lanes or of the St. Lawrence Seaway.
2. There would be no significant change in international political alignments or philosophies that materially would decrease or increase present world tensions.
3. There would be no significant changes in the present United States philosophy and structuring of tariffs.
4. There would be no significant changes in the policy of the federal government toward directing the location of industrial plants and complexes.

Specific assumptions.—The authors further assumed that, through 1965:

1. Chicago would receive at least its present proportion of the United States' share of the overseas trade carried *via* the St. Lawrence Seaway; that share is about 40 per cent of the tonnage of imports (excluding those from Canada) and about 43 per cent of the tonnage of exports to overseas destinations.
2. Traffic patterns now evident on the Lakes, through the Welland Canal, and on the St. Lawrence River would be maintained with only slight modifications, and there would be an increasing volume of this traffic.
3. Facilities for docking, handling bulk and general cargoes, trans-shipping to and from land media, and providing necessary financial and commercial services at Chicago would be at least equal to, and competitive in cost with, those at other important Lakes and Canadian ports.
4. Navigational improvements on the Calumet-Sag Channel would be completed as planned, and maximum impact of the Seaway on the Waterway-associated area particularly, but also on Chicago itself, would await completion of those improvements.

Summary of Findings and Conclusions

The impact of Seaway and Waterway improvement on the economic structure of Chicago and the Waterway-associated counties will be positive and beneficial. It is an honest evaluation to say that the impact will be minor . . . but minor only against the background of the tremendous economic complex that is metropolitan Chicago.

The Area's present trends of economic growth alone will increase 1965 total employment by nearly 270,000 more workers than in 1957; that "normal" growth will be seven times the expected 38,000 new employees attributable to Seaway improvement. Yet, for the great majority of American cities a Seaway-induced employment increase of some 38,000 would constitute a major—not just an incidental—expansion. Certainly no other area within the interior of the United States has the magnitude and diversity of industrial and com-

mercial development to minimize the impact of such major improved traffic routes as does Chicago.

By any conceivable measure—new freight tonnage, new industrial employment, added Area income—waterway improvement cannot add greatly to the already superlatively developed economic structure of Chicago. This does not imply that no impact will be felt or be separately measurable. The economies of both study areas will benefit, particularly, from a long-range side effect of waterway improvement: as water transportation becomes increasingly competitive to established land transport media in both capacity and quality of service, general and specific freight rates on all competing media will either actually be reduced or will increase less rapidly than other industrial costs. That anticipated indirect impact holds great promise for the economic growth of both the Chicago and Waterway-associated areas.

In its direct benefits, Seaway improvement will prove more selective. Although no industries not now within the study areas will be newly developed there solely because of waterway improvements, those existing industries dependent upon the accumulation of raw materials may be significantly benefited. On the other hand, industries hoping to find new and unlimited access to world markets through waterway improvements may experience less than their anticipated benefits as a consequence of the increased accessibility of Midwestern markets to foreign manufacturers. Of the nearly one hundred Chicago industries considered in detail, one-quarter will be measurably benefited by the Seaway; very few will be harmed. Nearly all the rest will continue their established developmental trends.

PART I

THE ECONOMIC STRUCTURE: METROPOLITAN CHICAGO AND THE WATERWAY-ASSOCIATED AREA

Although settled relatively late, the northern part of Illinois has become dominant in the economy of the state, acquiring the major concentrations of population and of manufacturing and non-manufacturing activity. Within that northern section one primary economic complex has emerged—the Chicago Standard Metropolitan Area. With well over one-half of the state's population, and nearly three-fourths of its manufacturing and service employees, the Illinois portion of the metropolitan area emerges not only as dominant within the state of Illinois but also as a major economic unit within the American Midwest.

Although the area is dominated by Chicago, other centers of importance are to be found within the northern part of the state. Among the most important are those along the Illinois Waterway from the southwestern margin of the metropolitan area to below Peoria (Fig. 1). Initially of independent origin, these Waterway-associated centers were early irrevocably tied to the Chicago concentration by the lines of railroads reaching out over the Illinois country after the mid-1850's. More recently they are being drawn further into a composite economic unit by the connecting link of the Illinois Waterway.

We shall see that the common denominator in the periods of economic growth of Chicago and of the Waterway-associated counties has been these areas' position in relation to a continually improving transportation system. Shifts in emphasis among the industrial types of the areas are associated with major economic stimuli—the Civil War, World Wars I and II, major national economic trends, and technological advances—but throughout the economic history of both Chicago and the Waterway-associated counties, it has been transportation which has dominated, directed, and timed their development.

The development of both parts of this economic composite—the Chicago Area and the Waterway cities—provides the framework within which future growth and change will occur. The past, however varied and diverse its pattern, has set the unalterable stage of action. Whatever the effects that the improved St. Lawrence Seaway and the improved Illinois Waterway may have, their force can be reflected only as a modification of the existing pattern. It is to this pattern, as essential background for the present and the future, that we now turn.

Economic Growth of Chicago

The decision of the Illinois state legislature in 1829 to sponsor a canal connecting the Great Lakes with the Mississippi River system brought to the southern end of Lake Michigan the primary focus of inland transportation in the United States. The new town of Chicago was established at the eastern terminus of the proposed canal, and sale of town lots was partially to finance waterway construction. In its early years following 1833, Chicago grew with the settlement of the prairies. It served as a focus of overland roads and wagon trails from the east and south; it became a main traffic port on the Great Lakes. Goods and immigrants sailed into the port of Chicago, and there was collected the produce of the new agricultural frontier. Chicago's importance, even in its earliest days, rested upon its transportational centrality.

It was therefore trade, not manufacturing, which dominated the economic life of early Chicago. Those industries which were devel-

oped were closely connected with the agricultural setting of the city. The movement of grain, cattle, hogs, and other prairie farm products to the new trade center led to the development of milling, brewing, slaughtering, and meat packing (Table I). However, the sparse settlement of the areas around Chicago and the inadequate land transportation facilities connecting those agricultural districts with the city tended to slow the development of industries, other than those supplying immediate needs of the local population and such special industries as grew out of the trade functions of the town.

Chicago's primary emphasis on trade activities—associated with collecting, storing, and processing of goods—underwent substantial change after the mid-1850's, again largely as the result of transportational factors. Improvement in transportation facilities expanded Chicago's trade area: the increased use of the Erie Canal, improvements in the Great Lakes waterways, the opening of the Illinois-Michigan Canal (1848), the development of the telegraph and—most important of all—the rapid spread of railroads placed Chicago in a position to serve commercially the entire Middlewest. Raw materials of all kinds necessary to the developing urban center and its agricultural hinterland were brought—particularly by water—to the city. The further settlement of the agricultural interior provided both increased farm surplus for processing and larger markets for manufactured goods.

The railroad added luster and strength to Chicago's position as the crossroads of the nation. At the same time, the railroads provided a market that was itself instrumental in altering Chicago's economic base to one with greater emphasis upon manufacturing. The Area quickly became a major supplier of railroad equipment: rolling mills were opened in the late 1850's, producing iron rails; in 1865, the first steel rails of American make were produced in the city. Car repair and building shops, boiler works, and railroad wheel plants were other additions to the city's industrial structure.

The expansion of large-scale farming on the prairies made new opportunities for the manufacture of barbed wire and of agricultural machinery, both of which centered in Chicago. Agricultural goods processing, however, remained the most important manufacture of pre-1860 Chicago. Meat packing and milling were the largest individual industries, and brewing and distilling were both important. Yet Chicago remained, prior to the Civil War, essentially a commercial center with an ever-expanding sphere of influence; its full industrial development was yet to come.

The Civil War brought it. For the first time, a truly national market appeared for manufactured goods and Chicago—the crossroad—was well-placed to serve it. The city became an industrial center of national importance, and manufacturing became nearly as important as trade and commerce in its economy. The industrial demands of the war, the Area's greatly expanded agricultural trade, and technological advances in many fields contributed to the expansion of old—and the rise of several important new—industries in Chicago. During the war, largely as a result of the closing of many southern livestock markets, the city became the most important meat packing center in the United States. Chicago's established wholesale and retail trade in clothes of eastern manufacture was augmented by a large local clothing industry when wartime producers of uniforms turned to the making of men's clothes. Stimulated by the Civil War, the manufacture of boots and shoes became important, and the furniture, agricultural machinery, and iron and steel industries grew with renewed vigor.

By 1875 most of the industries important in Chicago for the next half-century were well established. During the last quarter of the century, meat packing, men's clothing, furniture, agricultural machinery, and iron and steel continued their rapid growth, often at a rate exceeding that of the industry elsewhere in the nation.[1] Chicago gradually was achieving its full industrial potential, and during the period from 1875 to 1900 manufacturing became of greater importance than commerce to the economy of Chicago.

By the turn of the century, Chicago stood as the pre-eminent industrial center of the

[1]Industrial activity, growth, and decline have in this survey been measured solely by volume of employment; no other consistent or comparable figures are available.

American Midwest. But it did not stand entirely alone, for already there had emerged a series of specialized industrial sub-centers whose economic unity was soon to be recognized within the framework of a Standard Metropolitan Area[1] (Fig. 1). Gary, Indiana, and the other "Calumet" cities to the south and southeast of Chicago had developed,

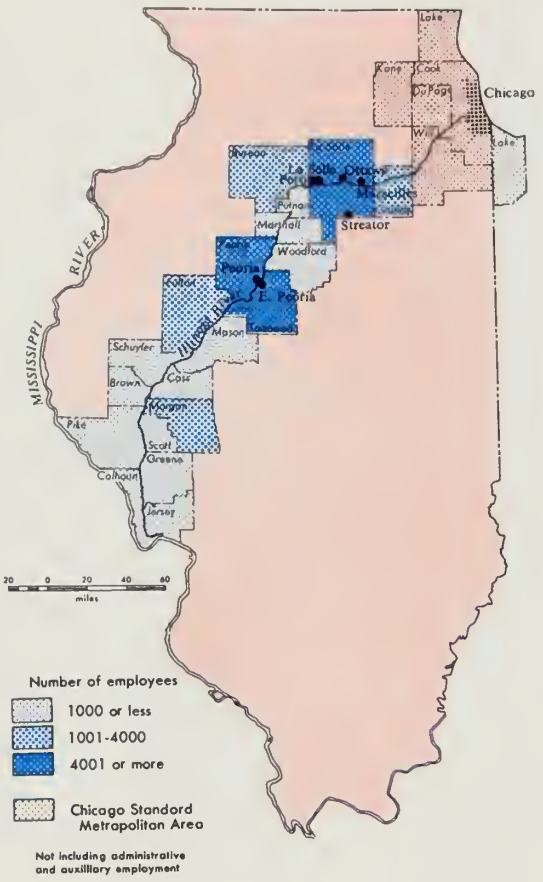


Figure 1

THE 1956 MANUFACTURING EMPLOYMENT IN WATERWAY-ASSOCIATED COUNTIES

Of the 19 counties bordering the Illinois Waterway, only 3 contain major industrial concentrations. Twelve of the counties have less than 1000 manufacturing workers each.

around the turn of the century, as principal concentrations of iron, steel, and heavy manufacturing. Of independent origin were the Fox Valley settlements of Kane County—established manufacturing cities during the early years of Chicago, but by 1900 becoming important as integrated outliers of Chicago's own industrial activity.

During the early years of the Twentieth Century, the Chicago Area became solidly established as the second-ranking industrial complex of the United States. The industrial demands and economic changes caused by World War I resulted in a realignment of the major industries in the city. During the twenty years after 1900 the iron and steel industry, its growth accelerated by the national demand for steel, became the largest and most important in Chicago. Meat packing dropped to second place, and for the first time a food processing industry was not the leader among Chicago's industries. Third position was newly won by printing and publishing (Table I). Other changes in Chicago's manufacturing structure occurred: men's clothing and the furniture industries declined in relative importance due to decentralization of activities and competition from other centers, while machinery (especially electrical machinery) and chemicals grew in importance.

By 1919 the Standard Metropolitan Area accounted for more than 6 per cent of all the manufacturing workers of the United States. Within the complex, Chicago was then, as it is now, the pre-eminent center of activity with 78 per cent of the Area's manufacturing workers. Its industrial structure had assumed the pattern maintained in subsequent years. Durable metal goods ranging from basic iron and steel products to machinery manufacture were dominant; much less important were the nondurables, despite Chicago's reputation as a center of printing and publishing and of meat packing.

During the two inter-war decades the most important economic events in every major industrial center in the United States were the swings of the gross business cycle. First came a decade of unusual prosperity, then one of unusual depression. The swings of the economic cycle were particularly strong in Chicago because of the great emphasis in the city on the manufacture of producers goods (goods for sale to other manufacturers)—an emphasis which was actually intensified during the in-

[1]The original Standard Metropolitan Area—composed of Cook, Du Page, Kane, Lake, and Will counties, Illinois, and Lake County, Indiana—was recently expanded to include McHenry County, Illinois, and Porter County, Indiana. Because data are so far available only for the smaller, six-county unit, all references in this report will be to the original Standard Metropolitan Area, not to the current "Chicago, Illinois-Northwest Indiana Standard Metropolitan Statistical Area."

(Base

	CHICAGO ONLY — Main Occupational Groups		
	1845	1860	1875
Primary Industries: in order of total employment (partially estimated)	Milling	Meat Packing and Allied Industries	Meat Packing and Allied Industries
	Meat Packing and Allied Industries	Milling	Men's Clothing
			Furniture
Chief Secondary industries: no special order before 1939	Brewing and Distilling	Brewing and Distilling	Boots and Shoes
	Building Materials	Furniture	Brewing and Distilling
	Wagon and Carriage Manufacturing and Repair	Building Materials	Machinery, Especially Agricultural
Other important Industries: no special order before 1939	Quarry Products	Machinery, Especially Agricultural	Milling
	Miscellaneous Machinery	Boots and Shoes	Building Materials
	Furniture	Printing and Publishing	Printing and Publishing
	Ship Building and Supplies	Railroad Equipment	Railroad Equipment
		Wagon and Carriage Manufacturing and Repair	Iron and Steel Products

ter-war period. During the "Boom" of the 1920's, Chicago industry employed a rapidly increasing share of the nation's manufacturing workers; during the 1930's, however, the greater impact of the depression in all areas manufacturing producers goods led to a sharp decline in Chicago's proportion of American manufacturing employment. Yet, by 1939, Chicago had regained its position; the Area held more than 6 per cent of the nation's manufacturing workers, and has maintained that level ever since.

During the inter-war period, through prosperity and depression, changes were taking place in the industrial structure of the Chicago Area. Two such developments are particularly noteworthy. First are the changes in the relative importance of some of the major industries. Differing growth rates, differing speeds of recovery from the depression, and changes in the advantages of Chicago for particular industries resulted in a new industrial hierarchy in the Area. Some of the old leaders were displaced. Meat packing, which had begun to decline in relative importance earlier, continued to drop; during this period Chicago lost its national dominance in this industry. Following World War I, both the men's clothing and the furniture industries also fell in relative importance in the Area. Others grew and assumed dominant positions in Chicago's industrial pattern during the inter-war period. Most of the industries which experienced relative or absolute growth were in the field of producers goods—especially tin cans and tin ware, basic iron and steel, several categories of electrical machinery, and paints and varnishes. The leading industry—with more than 20 per cent of all manufacturing employees in the Area—was one selling almost exclusively to producers: basic iron and steel. The only outstanding growth industry producing consumers goods was printing and publishing, which during the inter-war period grew to second rank among the Chicago Area's industries.

The second significant change was a considerable increase in the diversification of Chicago's industry. A great many new types of manufacturing located in the Area, some unknown until technological developments occurring during this period made them possible; diversity was also achieved by a very rapid growth of some industries which had been relatively unimportant in the past. Development of petroleum refining, organic and inorganic chemicals, radio and other branches of the electronics industry, and various types of nonferrous metal manufacture brought new industrial diversity to Chicago.

Chicago stood on the eve of World War II in a stronger position industrially than she had enjoyed after the first World War. In diversity of industry, in availability of trained and skilled labor, and in capacity to manufacture the goods so vital to the war effort, Chicago entered the decade of the 1940's industrially strong with her role in the nation's total manufacturing picture undiminished.

Because of the high level of military expenditure which has been maintained in the years since World War II, the war and post-war years may be treated as a single period. The years since 1939 have seen a further substantial reduction in the relative importance of some of Chicago's established old-line industries, and the rise of new industrial leaders, notably in the metal trades. Food processing, furniture and fixtures, and apparel underwent substantial relative declines. These three industries—which in 1939 accounted for more than one-quarter of all of the Chicago Area's industrial workers—had in 1947 less than 18 per cent and in 1957 less than 16 per cent of its manufacturing employment. There were, on the other hand, during the war and post-war years significant growths in the fields of metals and machinery manufacturing.

A new pattern of Chicago industrial domination gradually emerged as manufacturing activity became ever more concentrated on the production of durable goods.[1] Among the most important growth industries in the new pattern were electrical and non-electrical machinery manufacturing, which together in 1939 accounted for slightly over 18 per cent of the Chicago Area's manufacturing workers

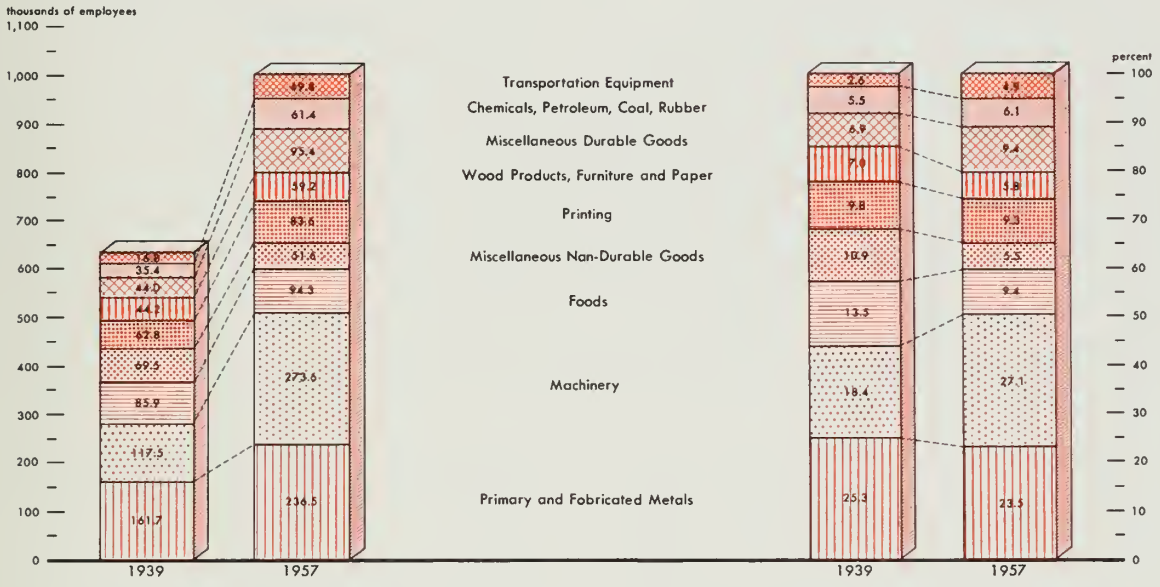
[1]The contrast between durable and non-durable goods should be recognized as distinct from the producers and consumers goods breakdown of industries. While the latter refers to the immediate buyers for whom the products are intended, the former division of industries is a generalized expression of the relative permanence of the products. For example, household electrical appliances, though consumers goods, are considered as (consumers) durables.

and by 1957 accounted for more than one-quarter. The net result of these industrial shifts and changes has been a weakening of Chicago's position in the old-line leaders such as food processing, furniture, and clothing, and a further increase in its early-developed importance in production of basic durable goods.

During the changes and realignments which resulted in the war and post-war period, Chicago's rate of industrial growth remained constant. In 1957, as it had in 1920, the Chicago Standard Metropolitan Area accounted for a little over 6 per cent of all the industrial wage earners of the United States. Although its industrial pattern was altered, its strength was undiminished.

run a full course—from complete domination of the local economy by a single outstanding activity, to such complete diversification that no one function remains predominant. In practice, the majority of the major urban centers of the United States show a combination of those two extremes: they specialize in one or a few principal activities, yet have as part of their economic base a notable diversity in secondary functions.

That economic base is not always, of course, dominated by manufacturing industries. Many centers, large and small, have achieved their distinctive economic character through concentration on non-manufacturing activities, such as government, retail trade, mining. In the majority of our larger cities, however, it is



MANUFACTURING EMPLOYMENT, 1939-1957 CHICAGO STANDARD METROPOLITAN AREA

Chicago's industrial employment has boomed since its low point at the end of the Depression. In the years since 1939, manufacturing employment has increased nearly 60 per cent to more than one million workers in 1957. Every industrial class save one shared in that expansion; but that single exception—miscellaneous non-durables—provides the key to an essential change which has slowly been taking place in the industrial structure of Chicago. Chicago gained its primary industrial reputation in the production of a wide array of consumers non-durables: meat packng, clothing, and so forth. In the years since the First World War, the Area has become increasingly a major heavy industrial center for the nation. As the graph shows, that trend away from the non-durables and toward specialized producers goods production was an important part of the wartime and post-war years. By 1957, machinery and metals accounted for over one-half of Chicago's manufacturing employment. The city's traditional role as clothier and hog butcher to the nation has been lost; in its place a new reputation in the field of producers durables has been developed. Besides metals and machinery, transportation equipment, chemicals, and miscellaneous durable goods all enhanced their relative positions within the Area between 1939 and 1957.

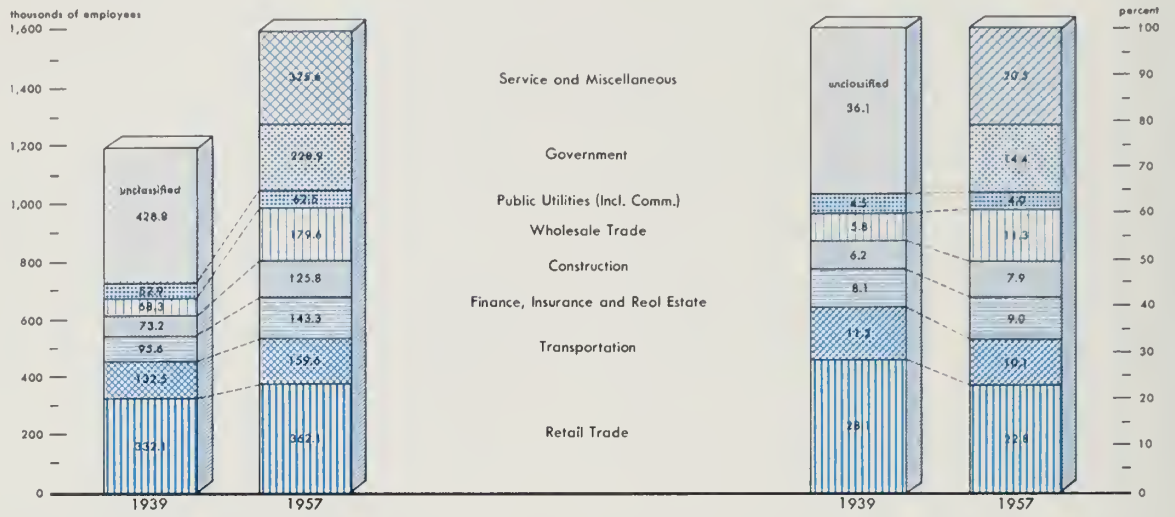
Present Economic Composition of Chicago

The unique character of any economic center is derived from the pattern of productive activities displayed there. That pattern may

the manufacturing industries which have given particular character to the local economy. Whatever may be the contemporary distribution of employees between the manufacturing and non-manufacturing sectors of their economy, it is for their industrial structure that

the cities are best known and by their relative development of manufacturing specialties that they are best characterized. Chicago is one of these.

ties, Chicago stands supreme in the interior of the country and second only to the larger New York concentration in national importance; although it holds less than 4 per cent of the



NON-MANUFACTURING EMPLOYMENT, 1939-1957 CHICAGO STANDARD METROPOLITAN AREA

With over 60 per cent of its employees in non-manufacturing activities, Chicago follows the pattern of most major metropolitan centers in the United States—towards an increasing employment emphasis on the provision of services. As befits a major regional center, the Area has developed a full range of essential centralized non-manufacturing activities. None is dominant within the city's employment structure, although some—like transportation—are exceptionally well developed. During the wartime and post-war years, the relative importance of non-manufacturing activities within Chicago's economy declined somewhat; non-manufacturing employment grew only some 34 per cent, while manufacturing workers increased nearly 60 per cent. Even so non-manufacturing Chicago remained numerically superior to the manufacturing sector.

Growth in the various service industries was not uniform. As the graph shows, all branches of non-manufacturing activity underwent substantial employment increases, but a new hierarchy of service activities was emerging. These changes—e.g., the relative decline of retailing, increase in wholesaling, etc.—reflect both national and local developments within the service industries.

The Chicago Area, as we have seen, has had a long history as a nationally important manufacturing center; its present industrial composition is basic to the characterization of its total economy (Fig. 2). The keynote of that composition is industrial specialization. Two industries stand out as dominant within Chicago's manufacturing structure; these are the metals—primary and fabricated, and machinery—electrical and non-electrical. Together, these industries account for more than one-half of all manufacturing employment and nearly one-fourth of the total employment in the Chicago Area.

Each of these, in its development in Chicago, has become important to the entire Middlewest. In general, of course, Chicago's dominance as the industrial center of interior United States is unassailable. In fact, in both manufacturing and non-manufacturing activi-

nation's population, the Chicago Area contains 6 per cent of the country's manufacturing employees and more than 5 per cent of its non-manufacturing workers. But in each of the four industry groups making up metals and machinery, Chicago's regional and national importance is even more striking. Measured by the numbers of people served by them, each supplies a population more than twice as large as that within the Area itself.[1] Certain industrial types within these four groups serve an even wider market; rolling mills, metal

[1]The "population served" technique is explained and illustrated in detail in Appendix B of this report. Essentially, the technique seeks to measure the regional significance of the local economic structure by applying to each activity a nationally derived "population-per-employee" figure. Assuming no areal specialization, each center for each activity should serve only its own population numbers; when the number of local employees is sufficient to serve a significantly larger population, the regional importance of the center is more clearly seen. The technique, of course, also reveals "deficit industries"—those in which local employment is insufficient to serve local population.

stamping, electrical appliances, and communication equipment; for example, each serve some twenty-five million people.

Not only regionally, but nationally, Chicago is a major supplier of primary and fabricated

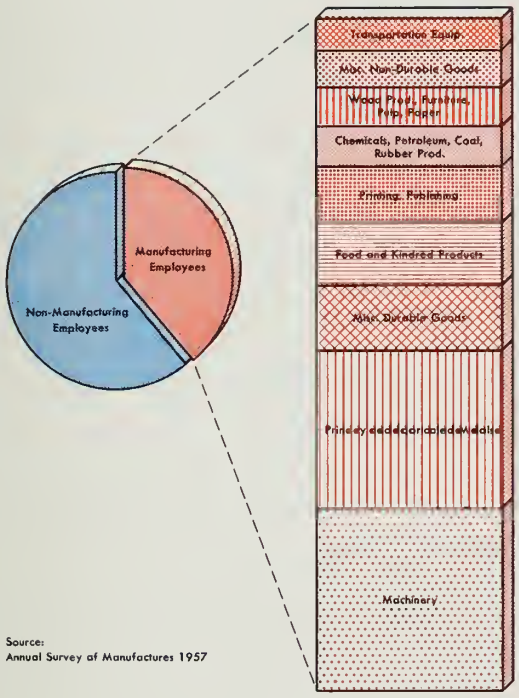


Figure 2

The 1957 Manufacturing Employment in the Chicago Standard Metropolitan Area

Metals and machinery industries dominate the structure and account for one-half the employees; the other half are divided among many groups and illustrate the industrial diversity of Chicago.

metals and of electrical and non-electrical machinery. For the four groups,[1] an average of 10 per cent of the total United States employment in these industries is found in Chicago; an even larger proportion of some of the specific industrial types within these groups is found there. Chicago has more workers employed in these four manufacturing groups, taken together, than any other industrial area in the United States and they are particularly responsible for Chicago's rank as the second largest industrial concentration in the United States.

Two other industries long established in Chicago—food products, and printing and publishing—are still of major importance both locally and nationally. Once famed as *the* meat packing center of the United States, Chicago has slowly declined in relative importance in this and some other branches of the food processing industry. In 1957, however, there were still more than 90,000 food processing workers in Chicago; this was about 9 per cent of all manufacturing employees in the Chicago Area and nearly 6 per cent of all those employed in this industry in the United States. Printing and publishing, although also declining relatively in Chicago, still employed in 1957 about 8 per cent of all the manufacturing workers in Chicago and nearly 10 per cent of all the printing and publishing employees in the United States. In both industries, then, Chicago remains a major regional supplier: in meat products, Chicago Area employment is sufficient to serve a population more than twice that of the Area; commercial printing is developed to supply some three and one-half times the Chicago Area's own population.

Certain other industries in the Chicago Area are perhaps more important in serving the national market than they are in providing employment opportunities in Chicago. Examples of these are products of petroleum refining and instrument manufacture, in which 9 and 11 per cent, respectively, of the total national employment in that industry is found in the Area. Petroleum refining in Chicago serves a population more than twice that of the Area itself, and establishes Chicago as the most important refining center in the midwestern region of the country. Within the general field of "instruments," Chicago serves two and one-half times its own population. Neither petroleum products nor instrument manufacture, however, employs more than 2 to 3 per cent of Chicago's manufacturing workers. Such industries as apparel, chemicals, transportation equipment, and the "miscellaneous" category each employ between 3 and 5 per cent of the total manufacturing workers in Chicago, though only 2 to 6 per cent of those in each industry in the United States.

Chicago's position and character as a manufacturing center is based not only on the dominance of a few industries—notably metals and

[1]In this report, "group" refers to the two-digit breakdown of industry in the Standard Industrial Classification; "type" refers to three- and four-digit subdivisions.

machinery—but also and very importantly on a diversity of industrial activities unexcelled anywhere in the country. Thus, a group of industries neither particularly large in terms of employment in the Chicago Area nor important in supplying the national market are nevertheless important to the character of the Chicago industrial complex. The textile, lumber and wood products, pulp and paper, rubber, leather, and stone, clay, and glass industries each employ more than one per cent of all manufacturing workers in the Chicago Area and up to 5 per cent of all the employees in the respective industries in the United States. While minor in number of workers, these industries are particularly important as sources of finished or semi-finished goods used by the major manufacturers in the Chicago complex.

Although Chicago's economic character is established particularly by her manufacturing, more workers (61 per cent of the total) are employed in non-manufacturing activities (Fig. 3). In 1957, the largest groups of non-manufacturing employees in the Chicago Area were in retail trade and services; together these provided nearly one-half of the non-manufacturing jobs. Construction, public utilities, wholesale trade, and finance, insurance, and real estate each provided 10 to 15 per cent of Chicago's non-manufacturing employment. In all these non-manufacturing activities, Chicago's share of United States employment is significantly above Chicago's share of the nation's population.

A combination of broad diversity and considerable specialization thus characterizes both the manufacturing and non-manufacturing industries of the Chicago Standard Metropolitan Area. In many of its economic activities, Chicago provides goods and services for people located throughout the nation. In every sector of its economy it serves at least as the regional center for a broad area of mid-America.

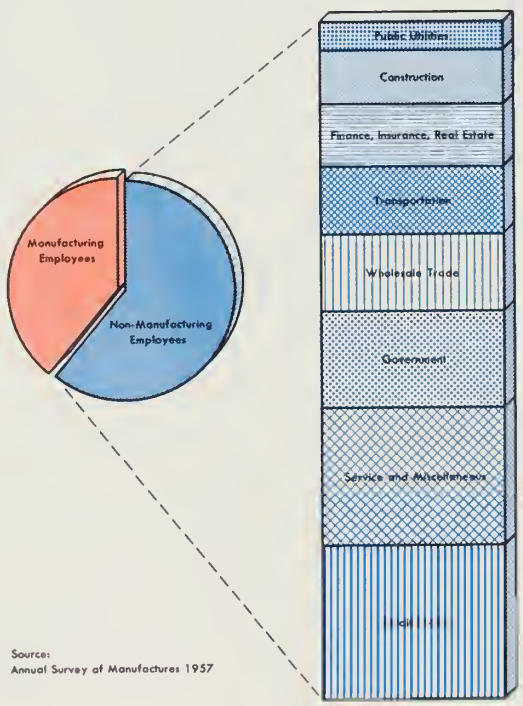


Figure 3

The 1957 Non-manufacturing Employment in the Chicago Standard Metropolitan Area.

Service and wholesale and retail trade workers make up the bulk of the non-manufacturing employees. Activities such as transportation, for which Chicago is justly famous, require fewer employees to fulfill their functions.

Economic Growth of the Waterway-associated Area

Stretching southwestward from Chicago along the Illinois Waterway is an area of rapid economic expansion (Fig. 1). As was true in Chicago, transportation has played a key role in the development of this Waterway-associated area. Early population centers, for example, were at places where major land trails crossed the Illinois River. With the increasing settlement and agricultural development of the northern part of the state, the Waterway towns grew in importance. Connected after 1830 by steamboats operating on the Illinois River, certain main economic centers emerged.

Navigational difficulties, plus the coming of the railroads in the mid-1850's, turned economic orientation toward land rather than water traffic and tied the river towns more closely to Chicago. Even the river improvement offered by the Illinois-Michigan Canal did little to maintain the significance of water transportation. In only a few instances were waterway-associated industries dominant in any of the developing manufacturing centers. The railroad remained essentially supreme until improvements in the Illinois Waterway by the mid-1930's had made water transportation an effective competitor to the railroads

in the economic organization of some of the downstate communities.

Through the years since the 1930's traffic on the Waterway has steadily increased—most of it upbound industrial and agricultural raw materials to and past the riverfront towns. On the basis of this increased flow of heavy raw commodities has come a change in the orientation of industrial enterprises in the Waterway centers. The outward spread of industry from the Chicago Area and the rise of new and expanded industry in the downstream cities suggest that in the future a new composite industrial area may develop, bound together by the unifying thread of the still further-improved Waterway now developing.

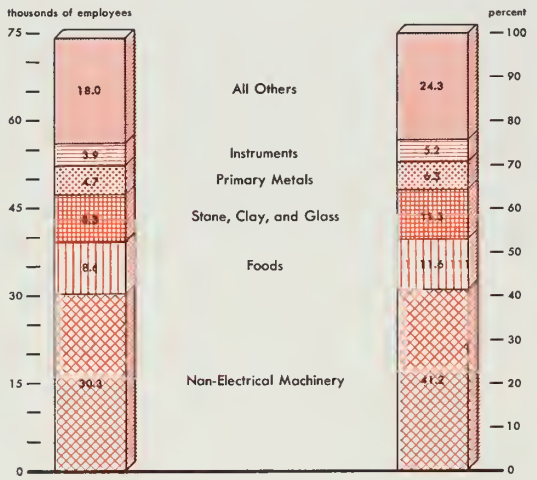
Manufacturing began in the Illinois River towns during the steamboat era. Most early industry was oriented toward agricultural processing to reduce the bulk and increase the value of commodities to be consumed elsewhere. The advent of the railroads, however, altered the commercial, industrial, and urban patterns of the Illinois River Valley after 1855. Peoria, Tazewell, and La Salle counties began to emerge as leaders in both manufacturing and commerce in the Valley area, although after 1870 manufacturing within the Valley grew at a faster rate than did commercial activities. More and more, industry turned away from agricultural processing; farm machinery, hardware, cement, glass, even the refining of ores, began to appear in the industrial pattern of the Illinois River Valley. Many of the new industries were based upon local coal and other raw materials supplies.

By 1900, a distinct pattern of urban and industrial concentration and dispersal had emerged in the River Valley. Upstream, in La Salle County, where industry was scattered among five separate centers, diversified manufacturing based on local raw materials and on production of specialty manufactured goods had become well established. Not all of La Salle County industrial centers were river-oriented; all, however, had good railroad connections. Farther downstream, Peoria emerged as the dominant industrial and urban center of the Middle Illinois Valley. Metropolitan Peoria, lying on both sides of the river, was in 1900 more closely tied to the agricultural production of its region than was the La Salle County district. Corn products, meat packing, and agricultural implements were prominent in its manufacturing structure.

Waterborne commerce, which had virtually ceased in the Illinois River Valley by around 1900, was revived by improvements in the Illinois Waterway completed in 1933. With that revival came some stimulation of manufacturing—particularly of industries producing bulk products like cement. Further dispersion of industry throughout the nineteen county area of the Illinois River Valley accompanied the improvement in Waterway facilities.

Present Economic Composition of the Waterway-associated Area

Despite the gradual spread of manufacturing throughout the valley area, the industrial structure of the Waterway counties remains dominated by two principal concentrations.



MANUFACTURING EMPLOYMENT, WATERWAY-ASSOCIATED COUNTIES, 1956

The industrial pattern of the Waterway-associated counties is one of areal concentration and of domination by only five industry groups. Of these, non-electrical (particularly, agricultural) machinery is the giant, with a single plant in the Peoria Metropolitan Area dominating. Peoria also dominates food products and primary metals. Instruments and the stone, clay, and glass products group are particularly prominent in the more diversified La Salle County complex, made up of five separate smaller industrial centers. None of the other 16 Waterway-associated counties are industrially important. Industrial employment in the entire Illinois Valley area totals less than 8 per cent of that of the Chicago Area, and the Waterway-associated territory is only now developing as an important composite industrial district.

The most important of these is metropolitan Peoria—the largest industrial and urban center of the Waterway-associated area. The second is in La Salle County—where a series of smaller centers together comprise a significant industrial agglomeration. These two concentrations, containing parts of three different counties, account for about 83 per cent of the total manufacturing employment in the Waterway-associated area at the present time.

Within these same concentrations, industrial emphasis is on five main manufacturing groups which together account for more than three-fourths of the manufacturing employment of the Waterway area. Nearly 60 per cent of all industrial employees of the Waterway area are concentrated in the Peoria district. Within that concentration, only three industrial groups are of primary importance. More than half of all the manufacturing workers are in the machinery industry which in turn is dominated by the single gigantic establishment of the Caterpillar Tractor Company plant in Tazewell County. Other leading industry groups are food products and primary metals.

Nearly one-quarter of all industrial employment in the Waterway-associated area is found in La Salle County. More diversified than the Peoria concentration and spread among four river and one railroad towns, many relatively small individual establishments of La Salle County produce a wide range of manufactured goods. Nevertheless, a majority of the workers of La Salle County are to be found in two separate industry groups: stone, clay, and glass products and instruments—particularly watches and clocks.

Industrial activity in the Waterway-associated area, therefore, is highly concentrated in area and in industrial type. Approximately 80 per cent of total manufacturing employment is located within only three counties of the area and in only five separate industry groups. The other Waterway-associated counties are relatively unimportant in industry. Only four counties—Bureau, Fulton, Grundy, and Morgan—have over 1,000 industrial workers, mostly employed in isolated small industrial establishments producing a wide variety of products (Fig. 1).

The industrial counties which dominate the Valley also contain the main centers of non-manufacturing employment. Concentration is not as pronounced as in industrial employment, for only some 70 per cent of total non-manufacturing workers are in the three leading industrial counties. The remainder of the non-manufacturing activity is distributed among the great number of small market towns and minor transportation centers serving the agricultural district of the Valley. Within the entire area, retail trade dominates the non-manufacturing employment structure.

PART II

THE ECONOMIC PROSPECT, 1965: BASIC GROWTH PATTERNS

In the dynamic, growing region that is the American Midwest, economic change is the regular order of the day. No point of enduring stability has as yet been reached—or is likely to be soon reached—in the economic structure of the Chicago Area or of the Waterway-associated counties. The Chicago complex itself—dominating the whole interior of the continent—possesses an economy gradually developed and radically changed over its 150 years of growth. It is an economy, furthermore, currently in the midst of a series of changes tied to conditions inherent in the Area's own history and in its role as an integral and influential component of the economy of the nation.

Against the background of such a massive, dynamic organization, the St. Lawrence Seaway must be viewed as simply a minor influence on an already huge and complex functional unit. For many years, of course, the Seaway route—like the Illinois Waterway—has contributed to the metropolitan area's transportational centrality; the expanded capacity of both routes, contingent upon their accomplished or proposed improvement, promises to them both an enhanced importance in the economic life of the city and of the Waterway-associated area. To recognize that as a probability, however, is not at all the same as making a reasoned assessment of the short-run impact of one or both of the improved facilities.

That assessment can only follow a determination of the pattern of "normal" or "basic" change already in progress within the Chicago Area and the Waterway-associated counties. The improvement of the St. Lawrence Seaway and of sections of the Illinois Waterway will present opportunities that singly—and together—must affect the course of economic development within the study areas. Neither route, however, has ever been an independent variable, and in neither case can the consequences of improvement be of sufficient moment to alter the mainstream of economic growth of the Chicago Area. Rather, there must be a strong presumption that no impact of the improved waterways could be detected without prior appreciation of the main lines of economic development already taking shape within the metropolitan area and the Illinois River counties. Attention will be turned here, then, to the anticipated basic economic changes within the study areas and to the economic structures those changes would have created by 1965 if no waterway improvements had been undertaken. After that examination —and only then—will it be possible to weigh the additional changes which may be directly related to the waterway improvements themselves.

The Chicago Standard Metropolitan Area

The economic complex that was metropolitan Chicago in 1957 must serve as the starting point for the analysis of changes to occur by 1965. This analysis must include, first, an investigation of the distribution of total employment among the various sectors of the economy and, second, an interpretation of those aspects of the economic structure that give it a particular form and character distinctive from other metropolitan areas. The graphs and their captions, found later in this section, provide the details of employment volumes and proportions in various economic activities in Chicago. Here we are concerned with the

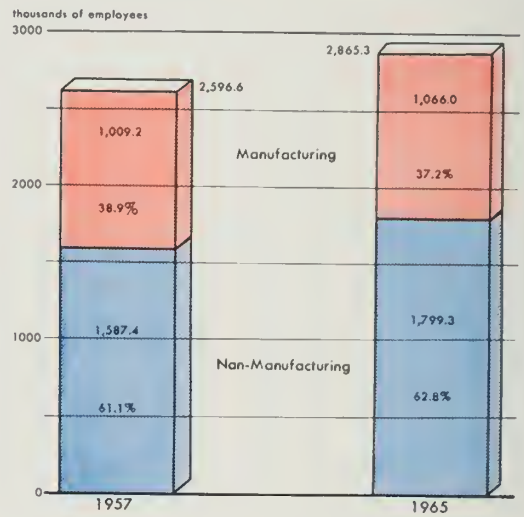
second, more interpretive, portion of the analysis.

From a cursory statistical view, Chicago in 1957 seemed remarkably similar to the other great metropolitan areas of the country. The majority of its workers were engaged in non-manufacturing activities—services, retail and wholesale trade, and finance, among others. A smaller proportion was employed in manufacturing. For those who picture Chicago as the bustling industrial giant of the Middlewest, the knowledge that nearly two-thirds of the Area's workers are in non-manufacturing activities comes as a great surprise. Yet their impressions of Chicago's industrial activity are not erroneous, for it is the city's particular assemblage of manufacturing activities which distinguishes it from other major centers of population and economic activity.

Prediction techniques.—It is within the framework of the economic structure of contemporary Chicago, and of the individual patterns of change already underway, that the 1965 employment complex will develop. That complex will be the result of a series of independently rooted developments which may move in widely divergent directions. The future, therefore, cannot be anticipated by the application of a simple multiplier to the economic structure of any earlier period. The economic composition of the Area by 1965 will inevitably be only the sum of its constituent parts, individually and often independently changing with time. It is, therefore, necessary to examine separately the patterns of change of each segment of the economy in order to assess realistically the future composite.

The predictions made here for each employment group have been fundamentally based upon mathematically-derived projections of the post-war experience in each major segment of Chicago's economy. In each case the resulting projection was modified—in some cases materially—by review of general developmental trends in that activity in the nation as a whole, by announced plans and investment programs within the Chicago Area, and, particularly, by reference to those recent short-run changes which give promise of locally affecting the long-run secular trend. On the basis of the resulting individual employment predictions, a cumulative 1965 Chicago Area employment structure was derived.[1]

The 1965 Prospect.—Study of the individual activity predictions shown on the accompanying graphs will suggest a composite picture of economic Chicago in 1965. The picture will be familiar, for basic economic change takes place slowly. There may be short-term fluctuations in the general level of economic activity, but any fundamental alteration of the total complex in a particular area can occur only over a long period. For this reason, we



TOTAL EMPLOYMENT IN THE CHICAGO STANDARD METROPOLITAN AREA, 1957 AND 1965

Under the conditions implied by the established growth trends of the Chicago Area, total employment will increase by more than 10 per cent between 1957 and 1965. Reversing the growth patterns developed during and after the Second World War, the non-manufacturing sector of the Area's economy is expected to increase in employment at a rate far higher than that of manufacturing industries (13 per cent *vs.* 6 per cent). These disparate growth rates would re-establish, by 1965, the Metropolitan Area's traditional manufacturing: service employment ratio of approximately 1:1.7.

[1]See Appendix B. Individual predictions were compared with such few other estimates of the same activities as were available. These estimates were found to involve different time periods, to have been evolved for different purposes, and to be based upon a variety of differing, sometimes complex, though not necessarily superior, techniques. Some of the other predictions suffered, in our opinion, from being based on extremely pessimistic views of increasing productivity and optimistic views of total population growth. Some, too, were arrived at by subdivision of a projected total growth—a technique which fails to recognize the divergent characteristics of the separate sectors of the economy. In the majority of cases our growth predictions proved less enthusiastic than the available alternatives; this relative conservatism seems to be justified by the most recently available employment figures for the Area.

must recognize that the Chicago of 1965 cannot be fundamentally different from the Chicago of today; no foreseeable event can produce a revolutionary change. The economic structure of 1965 Chicago, then, will be familiar in essentials.

Yet, it will be altered in its details. The labor force[1] of the Area will, of course, have grown larger—by more than 10 per cent or some quarter of a million employees. The relative importance of service employment will have increased. The non-manufacturing sector of the economy will grow by more than 13 per cent between 1957 and 1965; growth in manufacturing employment, on the other hand, will be at a rate of somewhat less than 6 per cent. The consequence of these disparate growth rates will be an increase from 61 to nearly 63 per cent of the labor force of Chicago engaged in non-manufacturing activities. This, of course, is a change of degree, not of kind. Within the individual sectors of the economy, the 1957 pattern of dominance will remain. In manufacturing, 1965 Chicago will still be fundamentally oriented toward machinery—electrical and non-electrical—and toward basic and fabricated metals; non-manufacturing employment will be dominated by retail trade and service activities.

The manufacturing sector.—In most of the major, established metropolitan areas of the country, the growth rate of the industrial labor force is lower than that of non-manufacturing employment. In this, Chicago is no exception, and manufacturing will employ a smaller proportion of the Area's total labor force in 1965 than in 1957. In one important

[1]For a discussion of our use of employment figures as the primary measure of economic structure, see Introduction.

TABLE II

MANUFACTURING EMPLOYMENT BY INDUSTRY GROUPS, 1957 and 1965: CHICAGO STANDARD METROPOLITAN AREA*

Industry Group	Employment 1957 (000)	Percentage of Total	Predicted Employment 1965 (000)	Percentage of Total
Foods	94.3	9.4	91.0	8.5
Textiles	7.1	0.7	5.0	0.5
Apparel	38.7	3.8	27.0	2.5
Wood Products	8.5	0.8	10.0	0.9
Furniture	24.3	2.4	24.5	2.3
Paper	26.4	2.6	27.0	2.5
Printing	83.6	8.3	87.0	8.2
Chemicals	39.7	3.9	42.0	3.9
Petroleum Refining	15.9	1.6	16.0	1.5
Rubber	5.8	0.6	5.5	0.5
Leather	9.6	1.0	8.0	0.8
Stone, Clay, Glass	19.6	1.9	21.0	2.0
Primary Metals	133.9	13.3	145.0	13.6
Fabricated Metals	102.6	10.2	118.5	11.1
Non-Electrical Machinery	138.5	13.7	154.0	14.5
Electrical Machinery	135.1	13.4	147.5	13.8
Transportation Equipment	49.8	4.9	55.0	5.2
Instruments	34.7	3.4	32.0	3.0
Miscellaneous	41.1	4.1	50.0	4.7
Total	1,009.2	100.0	1,066.0	100.0

*See Appendix B for statistical techniques and sources.

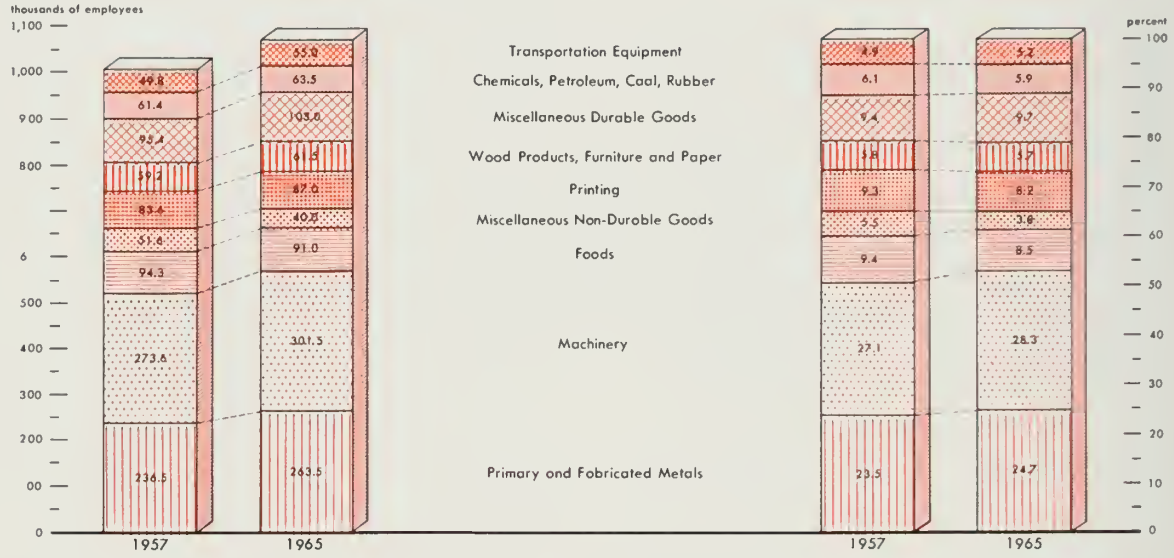
respect, however, Chicago is set apart from many of the other major industrial centers of the nation: increasing specialization on producers—rather than consumers—goods manufacturing.

Projected increases in basic and fabricated metals and in electrical and non-electrical machinery insure that Chicago, by 1965, will be an even more important supplier of industrial finished and semi-finished goods than it is today (Table II). The growth in these industries—predicted without any reference to the possible effect of Waterway or Seaway improvements—represents still a further step away from the course of Chicago's earlier industrial development when there was a primary emphasis upon agricultural processing and the production of non-durable consumers goods.

The predicted employment increases in the four primary industries, and the relative improvement foreseen in their position in the industrial structure of the Area, imply corresponding change in other industry groups. For the most part these movements—representing changed percentages of total manufacturing employment—will be minor. Among producers durables, stone, clay, and glass products and transportation equipment will show a slight upward turn, emphasizing the Area's increasing specialization on basic manufacturing. Many of the consumers non-durables, on the other hand, will be relatively less important than they are today. Such relative declines will take place even though employment within the consumers goods fields may be increasing and Chicago will remain a leading national center of production.

While no basic alteration in the manufacturing structure of Chicago can be anticipated for 1965, an unmistakable pattern of change has been established. Increasing specialization on producers durables, which has been the order throughout the recent past, will continue unaltered to 1965. The former dominance of consumers non-durables has been effectively ended, and in most branches of industry where they are the main product a further reduction in relative importance is predicted.

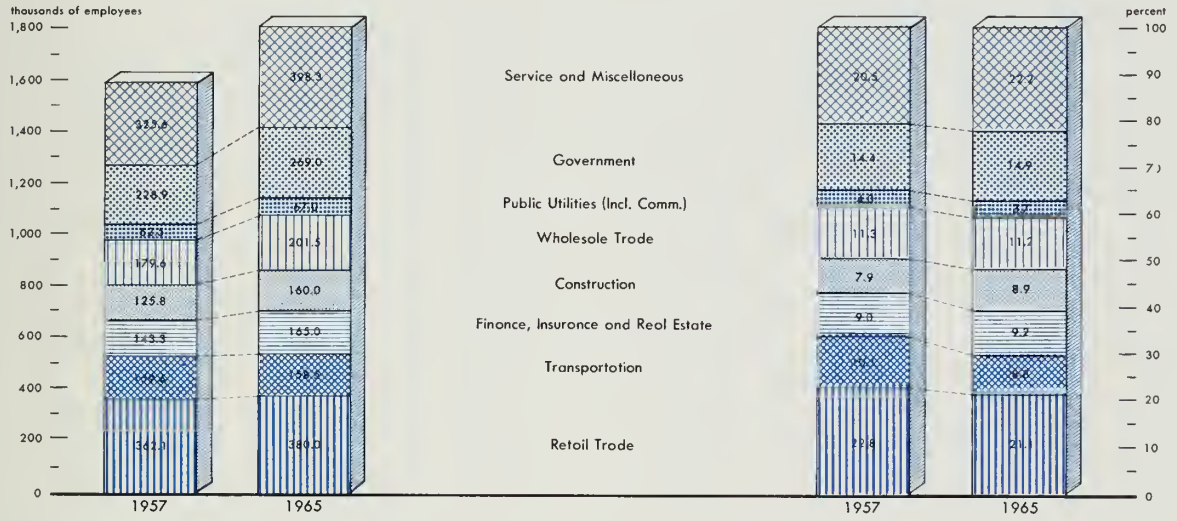
The non-manufacturing sector.—Chicago in 1965 will show an even greater emphasis on



MANUFACTURING EMPLOYMENT, CHICAGO STANDARD METROPOLITAN AREA, 1957 AND 1965

A continuation of the Area's developing pattern of industrial specialization is predicted up to 1965. By that date, Chicago Area manufacturing will be even more dominated by producers durables than it was in 1957. Those growth patterns observed since 1939 leading to the increasing emphasis on electrical and non-electrical machinery and on fabricated and primary metals will continue; by 1965, these four industry groups will claim more than 53 per cent of Chicago's industrial workers. Sharing this growth, and part of the same developing pattern of specialization, will be miscellaneous durable goods and transportation equipment. Non-durables will decline: food products—particularly meat packing—will be relatively less important in 1965 than in 1957. Similar relative declines will occur in other of the non-durable manufacturing industries.

non-manufacturing activities than it now displays. In this, the Area will simply be reflecting the consequences of its own rapid population increase and a general national trend toward a steady relative growth in tertiary workers. By 1957, well over 50 per cent of the nation's total labor force—up from one-third in 1920—was in the various "service" industries. These largely non-mechanized activities with high labor-inputs have been claiming an ever-increasing proportion of the nation's discretionary expenditures. That trend, particularly pronounced in major metropolitan areas like Chicago, stems from increasing incomes, greater productivity, more leisure, and higher levels of living of, primarily, the manufacturing



NON-MANUFACTURING EMPLOYMENT, CHICAGO STANDARD METROPOLITAN AREA, 1957 AND 1965

The non-manufacturing employment structure of the Area will not substantially change by 1965. Only transportation will employ fewer workers than in 1957—a consequence of changing labor requirements of railroads, not a reflection of any decrease in Chicago's traditional position as the transportation center of the nation. Following national patterns of increased expenditures on the services—professional and personal—the service and miscellaneous category will grow to over 22 per cent of all non-manufacturing workers by 1965. Self-service and other changes in retailing suggest a relative decline in employment in that field in the future. The great increase in non-manufacturing over manufacturing employment (nearly 4 to 1) predicted between 1957 and 1965 reflects a delayed re-establishment of the Area's traditional manufacturing: service employment ratio which was temporarily upset by great increases in industrial activity during the war and post-war years.

workers whose products are the basic source of urban income.

The principal beneficiary of the rapid expansion of non-manufacturing employment will be the composite group of service and miscellaneous activities (Table III). This, in 1965, will be for the first time the most important segment of the non-manufacturing sector. In fact, in both growth rate and numerical increase, service employment will dominate the predicted pattern of change in the non-manufacturing activities.

The service and miscellaneous group, however, will not account for all growth in the non-manufacturing sector by 1965. Both in government and in contract construction, employment totals will be sharply above their 1957 level. Although Chicago is not a capital city, its outstanding regional dominance and its own great population size have made the Area an important center for governmental activities at all levels—local, county, state, and national. The prospect for 1965 is for an increasing volume and proportion of workers in governmental employment. Simultaneously, and reflecting the rapid physical growth of the Chicago Area, will come a striking increase in construction workers. A more modest total and relative increase will come in the field of finance, insurance, and real estate, and growth in this category will be a significant expression of the Chicago Area's still-growing regional dominance.

Retail trade is the largest non-manufacturing group that is expected to show significant relative decline in employment by 1965. Al-

though—reflecting the growing population of the Area—there will be some increase in the number of persons employed in retail trade, its growth rate is lower than that of other major elements of the non-manufacturing sector. Self-service, pre-packaging, and other recent innovations in retailing mean that in Chicago, as in the rest of the nation, the relative significance of retail employment is steadily falling.

In transportation a slight relative and absolute decline may be predicted for 1965. For nearly a century, railroads and intra-city carriers have together accounted for the majority of transportation employees in the Chicago Area, and for much of that period their numbers of employed have risen steadily. Now, a reversal of that trend is evident. Increased labor efficiency and automated equipment, such as electronic car sorters, have recently drastically reduced labor requirements on interstate railroads without in any way diminishing Chicago's railroad centrality and importance. The reduced use and lower employment requirements of local mass transit carriers since the introduction of the automobile is obvious and accepted—not only in the Chicago Area but also in nearly every other American city, large or small. Employment declines in these two phases of Chicago's transportation industry offset the predicted increase in number of workers in the "other transportation" category (Table III). Including a wide variety of long-distance carriers—of which trucks are the most important—growth in "other transportation" reflects both the increasing flow of goods necessary to support the rapidly expanding metropolitan area and the still-growing importance of Chicago as a regional collecting and distributing center.

TABLE III

NON-MANUFACTURING EMPLOYMENT BY EMPLOYMENT GROUPS, 1957 and 1965: CHICAGO STANDARD METROPOLITAN AREA*

Employment Group	Employment 1957 (000)	Percentage of Total	Predicted Employment 1965 (000)	Percentage of Total
Mining	3.6	0.2	3.3	0.2
Construction	125.8	7.9	160.0	8.9
Railroads and Bus	82.0	5.2	70.5	3.9
Other Transportation	77.6	4.9	88.0	4.9
Public Utilities (including communications)	62.5	4.0	67.0	3.7
Wholesale Trade	179.6	11.3	201.5	11.2
Retail Trade	362.1	22.8	380.0	21.1
Finance, Insurance, Real Estate	143.3	9.0	165.0	9.2
Service and Miscellaneous	322.0	20.3	395.0	22.0
Government	228.9	14.4	269.0	14.9
Total	1,587.4	100.0	1,799.3	100.0

*See Appendix B for statistical techniques and sources.

The 1965 non-manufacturing employment pattern in the Chicago Area, then, will primarily reflect the local expression of emerging national trends. But secondarily it will be strongly affected by the unique economic structure of the Area itself.

By 1965, then, presently developed growth patterns within individual Area employment categories will create a labor force larger than that of 1957 by nearly 270,000 employees. For each new manufacturing worker, 3.7 non-manufacturing employees will be added to the Area's labor force. This disparity reflects a nearly explosive expansion of non-manufacturing workers since the early 1950's—an expansion expected to maintain its pace until 1965, at least. The ratio between manufacturing and non-manufacturing employees predicted here is, from the long-run view, too heavily weighted in favor of the non-manufacturing sector. However, the disparity reflects a belated expansion of the service industries held back, relatively, in their Area development by the rapid and disproportionate increases in manufacturing employment during and immediately after the Second World War. By 1965, under the growth patterns predicted here, the Chicago Area's traditional manufacturing: service ratio of 1:1.7 will be re-established, and a new cycle of growth in both manufacturing and non-manufacturing sectors may be expected.

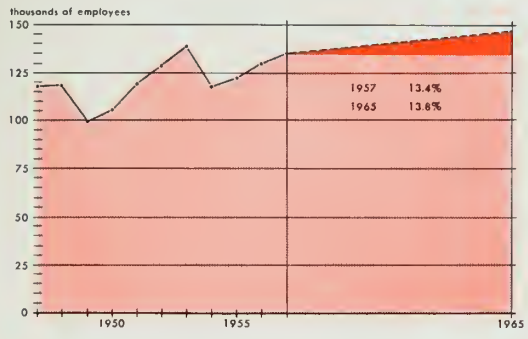
The levels of employment predicted for 1965 for major manufacturing and non-manufacturing activities are shown on the following graphs. In each prediction the historical data have been mathematically projected; where necessary, that projection has been modified to take account of current developments of significance of the growth of the activity. The text accompanying the graphs reviews the historical development of the activities within the Area and discusses the main influences affecting their 1965 employment prospects.

NORMAL GROWTH PREDICTIONS

Machine Builders to the Nation

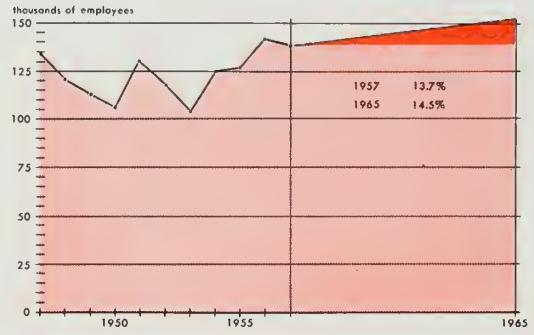
Machine building is Chicago's major contribution to the functioning of the nation's industry. The production of both electrical and non-electrical machinery is, in fact, remarkably developed in Chicago. The Area accounts for more than one-fifth of all the machinery workers in the United States. Of greater significance locally, machine building employs more of Chicago's workers than any other branch of industry.

The machinery industries are no newcomers to Chicago. Within ten years after the founding of the City, steam-driven machinery made its appearance among the Area's manufactures; by 1847 agricultural machinery was being produced, starting an industry which was to find its national center here. Long before the manufacture of *electrical machinery* had become important in most metropolitan areas of the country, the industry was well-developed in Chicago. Although the number of employees has fluctuated from year to year, *electrical* and *non-electrical machinery* have steadily increased in importance within the Chicago Area. By 1957, more than one-quarter of all of Chicago's manufacturing workers were producing machinery.



ELECTRICAL MACHINERY

In America's dynamic industrial pattern, it is difficult for any city to hold permanently a position of dominance in any activity. Chicago's proportion of the nation's machinery workers is not now as large as it was in the immediate postwar period. Particularly in *electrical machinery,* which is now produced in most metropolitan areas of the country, growth in Chicago has not kept pace with the national rate of increase. Nevertheless, one out of every five machinery workers in the United States is still employed in Chicago.



NON-ELECTRICAL MACHINERY

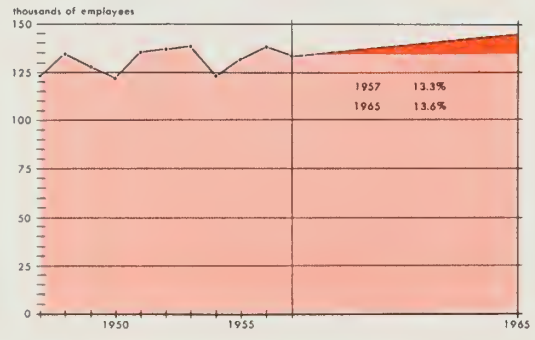
Prospects for continued growth in Chicago are good. Employment in machine building is expected to increase by more than 10 per cent by 1965, with the greatest expansion to come in electrical machinery. Even without considering the potential impact of the Seaway upon Chicago's industry, by 1965 more than 28 per cent[1] of all the Area's workers should be engaged in *electrical* and *non-electrical machinery* manufacture. The position of the machinery industry as a leading industrial activity in the Chicago Area seems assured.

[1]Percentage figures in the text and on these and subsequent graphs represent the activity's proportion of total employment in manufacturing or non-manufacturing industries.

City of Steel

To many people the glow of blast furnaces and the clang of drop forges epitomize industrial Chicago. Theirs is no false impression, for one of the country's greatest concentrations of metal industries is found in the Chicago Area, extending from the great steel mills at the south end of Lake Michigan to the fabricating plants in the northern and western suburbs. One out of every four manufacturing workers in the entire Area is employed in metal making or fabricating.

These industries are relative newcomers to Chicago. The City was already famous as a manufacturing center, specializing particularly in agricultural goods processing, before basic metals entered the employment structure. Although there had been some fabrication of metals as early as the 1850's, there was no primary

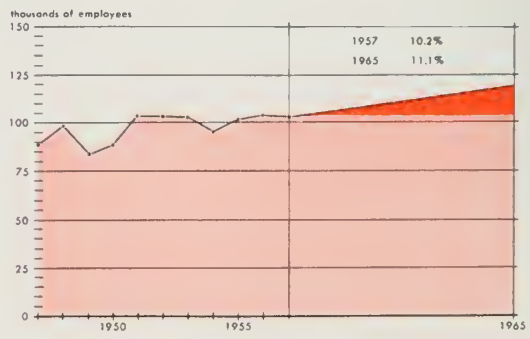


PRIMARY METALS

iron or steel production within the city until after the Civil War. From these beginnings, growth in capacity and employment was continuous, punctuated by spectacular developments such as the construction of the Gary works just after the turn of the century.

A main source of Chicago's strength, the metals industries are plagued by marked-short-term fluctuations in employment, but these variations are related to the structure of the industry in the United States. Throughout the whole post-World War II period, Chicago has accounted for about one-fifth of all American workers in the metals industries. Yet primary and fabricated metals have become gradually less important in the employment structure of the Area itself. That relative decline has been due solely to the *primary metals* which have had a steadily decreasing share of Area employment since 1939. Despite their lower proportion of all manufacturing employment, the metals industries remain vital factors in the industrial structure of Chicago. Their over-all trend in employment has been upward and their prospects for future growth are good.

Without consideration of possible adverse effects of foreign steel entering Chicago through the Seaway, an employment increase of more than 9 per cent is predicted by 1965. Most of that increase will occur in *fabricated metals*. Outlook for growth even in *primary metals* is surprisingly good, despite fears of foreign competition. Development of taconite plus the prospects of unexpected longevity of the Mesabi ores give Chicago good future prospects in basic metals. By 1965, nearly one-quarter of all Chicago Area manufacturing workers will still be employed in primary and fabricated metals manufacturing.

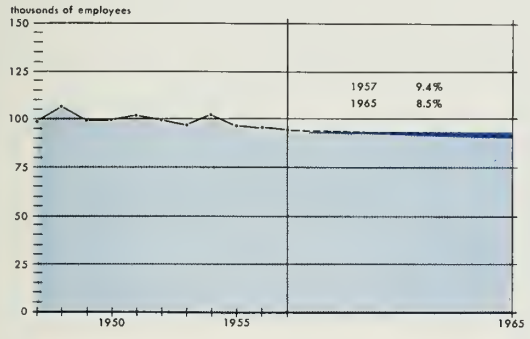


FABRICATED METALS

Former Giants

Food products and printing and publishing have fallen far from their ranking at the turn of the century when they were numbered among the three leading industrial employers in Chicago.

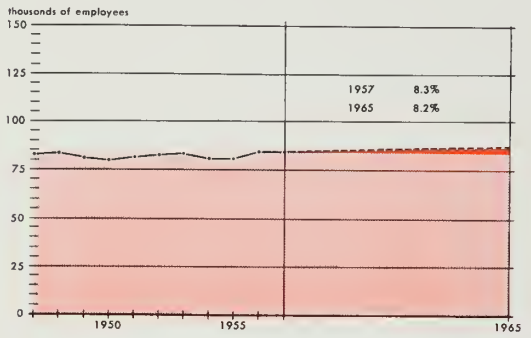
Despite the temporary rise of other food-related industries, it was meat packing which ruled the *food processing* industry in Chicago from its earliest days. Chicago's national dominance in meat packing lasted through the first World War, when secondary centers developed in other middlewestern cities and reduced the overwhelming dominance of Chicago. The recent cessation of slaughtering by major packers in Chicago and the abandonment of their now obsolete plants spells the end of an era, but most certainly not the end of the industry in the City.



FOOD PRODUCTS

Like food products, *printing and publishing* was among the early industries in the city of Chicago, but until 1918 was almost solely confined to the printing of local newspapers. It wasn't until after the first World War that greater diversification came with the rapid development of other branches of the industry—book and catalogue publishing, railroad timetables and tickets, financial paper. In more recent years, growth of the industry has not kept pace with the Area's over-all industrial development, and its relative importance has declined.

Of the two former giants, *food products* has shown the greatest decline in employment in recent years—almost entirely as a result of the decline in meat packing within the City. Nevertheless, by 1957 the food products industry in Chicago still employed more people than the City's share of United States population would have suggested. Although there has been no comparable numerical decline in *printing and publishing*, there has been a relative drop in the significance of this industry in Chicago's total industrial structure.



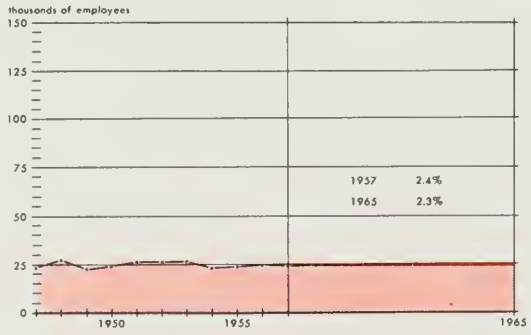
PRINTING AND PUBLISHING

Despite the decline in relative importance of *food products* and of *printing and publishing* in the economic structure of Chicago, both industries have now reached a stable level of employment. They are both still important in the Area's employment structure, accounting together for slightly more than one-sixth of all manufacturing workers.

Relatively little change in employment will occur by 1965. Most readjustments in the meat packing industry already have taken place; only a slight decline in employment in *food products* is predicted. *Printing and publishing*, on the other hand, appears to have prospects of modest growth. In 1965 each will employ approximately 8 per cent of Chicago's manufacturing workers.

Parlor Cars and Parlor Chairs

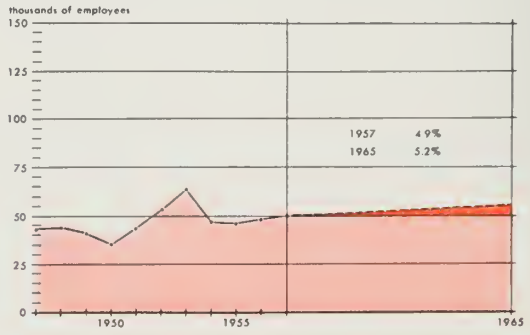
As Chicago has experienced dynamic growth in the production of metals, machinery, and a host of new miscellaneous durable goods, some of the older employment leaders within the Area have experienced an inevitable decline in their relative importance. Among these are the *furniture* and *transportation equipment* industries — durable goods similar to each other only in their decline in relative importance within the Chicago Area. In both, the metropolitan region was once an outstanding national production center; in both, Chicago has now lost some of its former dominance to competing areas offering new and different products.



FURNITURE

The *furniture* industry in Chicago became nationally important following the Civil War. By 1885, the Area exceeded all other centers in the United States in number of furniture workers and in volume of output. After the First World War, however, furniture manufacturing lost ground in the local employment structure and the national ranking of Chicago's furniture industry gradually declined as small competing centers, particularly in the low-wage areas of the southern hardwood forests, were developed. Even with this decline, however, in 1957 the Area accounted for more than 6 per cent of all United States furniture workers, although that represented only 2.5 per cent of Chicago's manufacturing employment. Employment in furniture and fixtures is expected to remain stable to 1965.

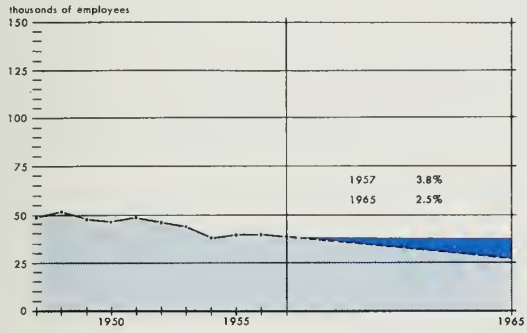
Chicago's early importance as a national center of *transportation equipment* manufacture was based almost completely upon its railroad centrality. It was always railroad equipment which was dominant in the City's transportation industry. The gradual decline in importance of railroads, development of railroad equipment manufacturing in other centers, and the increase in other branches of transportation equipment manufacturing—such as automobiles and aircraft —not well represented in Chicago, have spelled a gradual decline of the City's national dominance. Despite a temporary revival during World War II and periodic fluctuations in employment recently, the *transportation equipment* industry will not regain its former dominance for the Chicago Area. Nevertheless, by 1965 transportation equipment manufacturing will employ more workers than it did in 1957, will have grown within the Area by some 10 per cent, and will slightly improve its standing within the total employment structure of Chicago.



TRANSPORTATION EQUIPMENT

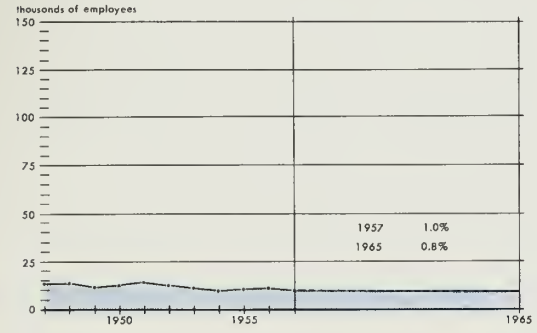
Cloth, Clothes, and Shoes

These three are among the few Chicago industries actually declining in employment numbers. Of the three, only *apparel* (particularly men's clothing) was ever among the leaders in Chicago. With its start in the manufacture of uniforms during the Civil War, the men's ready-made clothing industry assumed great importance in Chicago after 1870. It served particularly the easily accessible markets in the southern and



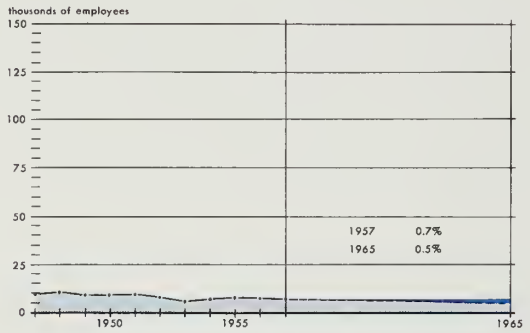
APPAREL

western sections of the country, taking advantage of Chicago's transportational centrality. Men's apparel reached its greatest importance as a Chicago industry just prior to World War I, after which it began a relative decline continuing to the present. The *leather industry* (particularly boot and shoe manufacture) has



LEATHER

also declined within Chicago. Never as significant in the employment structure of the city as was apparel, leather industries and boot and shoe making were activities ancillary to slaughtering and meat packing which had its national center here. With the development of specialized shoe manufacturing centers, the raw material advantage of Chicago no longer was as important and the industry steadily declined. *Textiles* have never been important in the industrial structure of Chicago; the industry in the city has mainly concentrated on the production of low-cost textiles of limited demand.



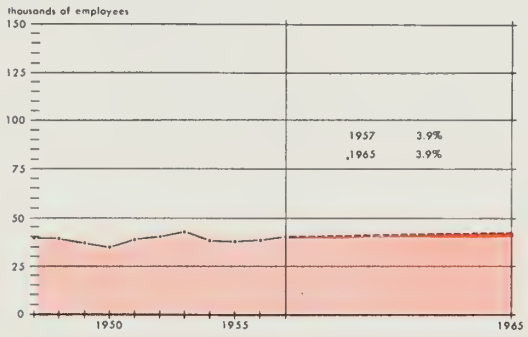
TEXTILES

Within Chicago, 5.5 per cent of all manufacturing workers are employed in these groups, in contrast to the national average of 16 per cent. Much of the decline in importance of these industries has occurred during the past quarter-century, during which numbers of workers have steadily declined and the importance of the industries to the Area's employment structure has fallen by one-half. The greatest relative change has occurred in *apparel,* and particularly in men's clothing. As shown in the graph, this industry group has the greatest employment volume of the three and has as well the greatest rate of decline in employment.

There will be continuing decline, amounting to 30 per cent of the 1957 employment, in these three groups by 1965. *Apparel* alone will fall about one-third in number of employees. By 1965 the three industry groups together will account for no more than 3.8 per cent of the Area's manufacturing employment.

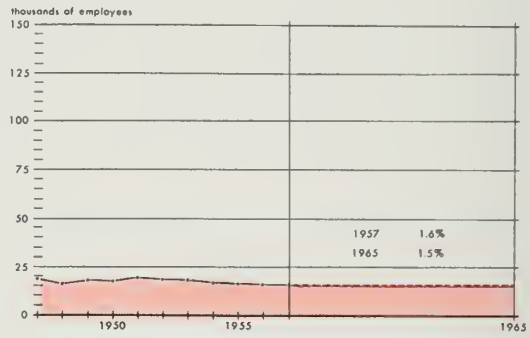
The Promising Newcomers

Chemicals, petroleum, and rubber, employing together some 6 per cent of Chicago's manufacturing workers, are among the smaller and newer basic industries in the Area. Each is still relatively unimportant in Chicago in total number of persons employed; each had its major development during the period following the First World War; and each served primarily as a local supplier of raw materials to other Chicago industries. None of the three has prospects for any great increase in employment by 1965, but this does not mean stagnation of the industries here. Even *chemicals,* which have in recent years enjoyed more new investment than most industries in the Chicago Area, will achieve a great increase in total value of output with only a very modest increase in labor force.



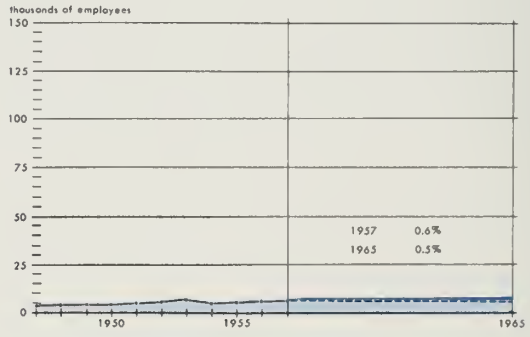
CHEMICALS

Chemicals, petroleum, and rubber have all, since 1929, maintained or increased the share which they represent of all Chicago Area employment. The greatest improvement in relative position has been in *chemicals;* accounting for only 2 per cent of the Area's manufacturing employment in 1929, it rose to 4 per cent by 1957. The *petroleum* and *rubber* industries of Chicago have, over the same span of time, maintained their relative position by expanding employment at about the same rate as all manufacturing. During the postwar period, chemical and petroleum industries in the Chicago Area have declined in national importance relative to other areas while rubber has slightly increased its share of the total national employment in the industry.



PETROLEUM AND COAL

Prospects for growth in the Chicago Area to 1965 are best for the *chemical industry,* in which more than a 9 per cent increase in employment is expected. Practically no increment in employment is anticipated for *petroleum refining* and *rubber,* although these industries may continue to grow in production and size if

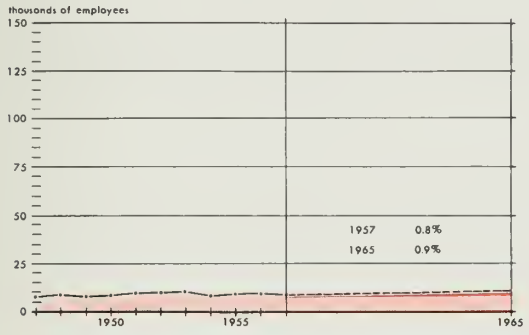


RUBBER

stimulated by the improvement of water transportation. As a result, the share of total employment represented by these three groups combined should fall slightly below its 1957 level. These three groups will represent 6 per cent of Chicago's 1965 manufacturing employment.

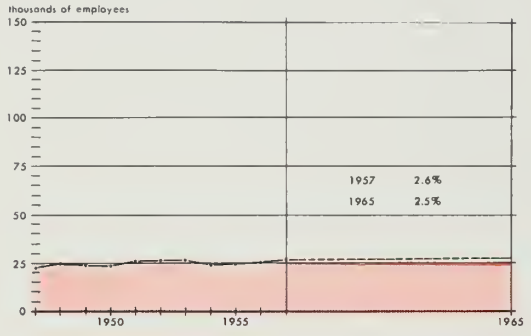
Products of Forest and Quarry

Only the distinctly market-oriented phases of these three industry groups, such as building materials and millwork, are well developed within the Chicago Area.

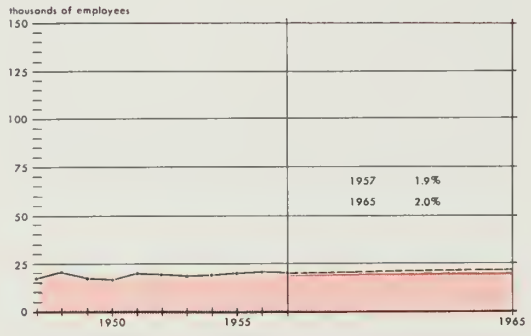


WOOD PRODUCTS

Because of the growing local market, all three are steadily increasing in employment, though none is yet a major Area employer. Since 1929, *lumber and wood, paper and pulp,* and *stone, clay, and glass products* have been slowly increasing their share of Chicago's manufacturing labor force; by 1957, they accounted for over 5 per cent. That slow, steady growth will continue to 1965. Together, the groups may expect between a 6 and 7 per cent increase in employment and may look forward to a slight increase in their proportion of the Chicago Area's manufacturing labor force.



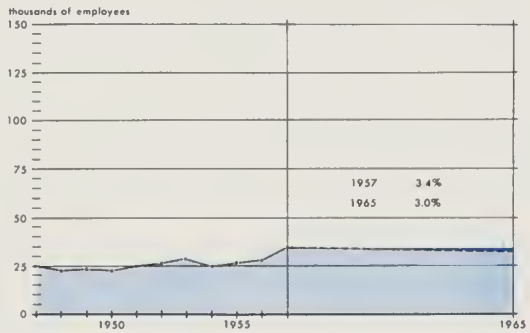
PULP AND PAPER



STONE, CLAY AND GLASS

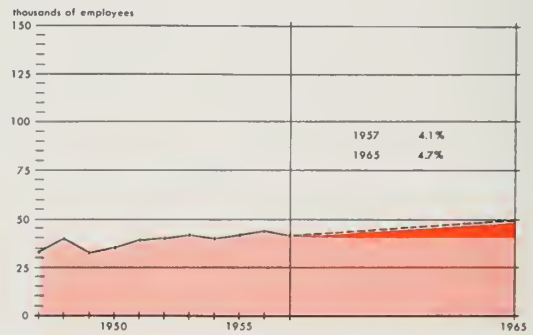
Odds and Ends

Part of Chicago's industrial reputation rests upon the diversified manufacturing of the Area; *instruments* and *miscellaneous industries* are major contributors to



INSTRUMENTS

that diversity. Locally, they accounted, in 1957, for 7.5 per cent of all manufacturing workers; nationally, they occupy less than 5 per cent. Since 1929 these industries, too, have had a gradual increase within the Area; the upward trend will continue to 1965, when

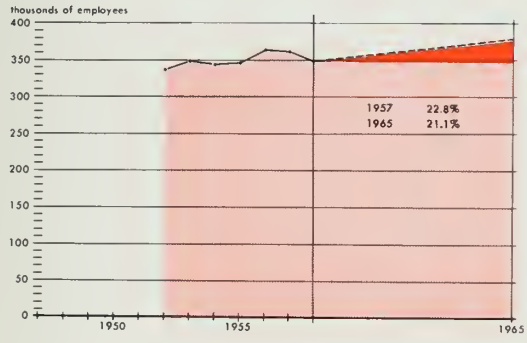


MISCELLANEOUS

nearly 8 per cent of the Chicago Area's manufacturing employment will be represented by these groups. That upward trend in employment is national as well as local, but Chicago's growth will be sufficient to maintain the Area's relative national position.

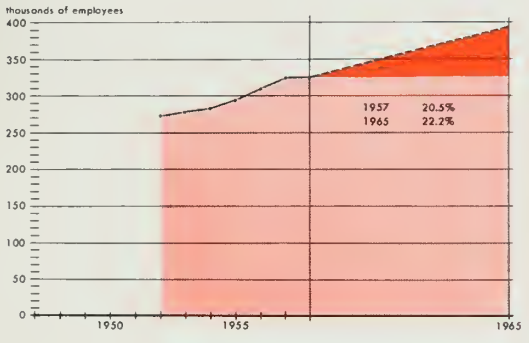
Leaders in Non-manufacturing Activities

The non-manufacturing sector—larger than manufacturing in total employment – will grow to even greater importance by 1965. The four leading non-manufacturing activities are shown here; each will continue to grow, though at different rates, to 1965. Retail trade, in first place in 1957, will drop to second. Representing only 21 per cent of the Area's non-manufacturing employment in 1965 (present United States average is 33 per cent), *retailing* is not so much



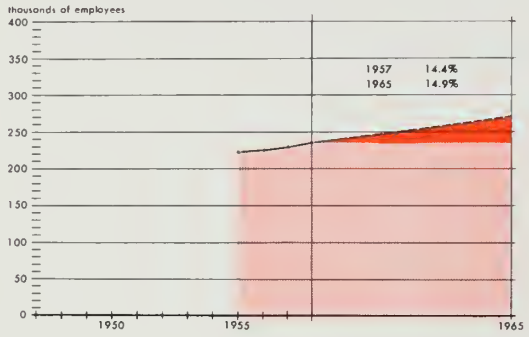
RETAIL TRADE

underdeveloped within Chicago as it is submerged by the great number of other centralized activities developed within a major regional center. With nearly explosive growth, *services* will increase 23 per cent to



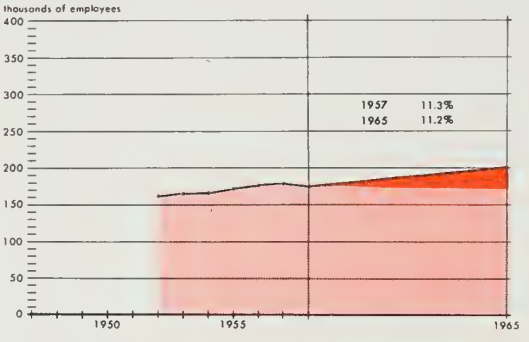
SERVICE AND MISCELLANEOUS

1965 and claim first place. This growth rate of *services* is not unusual; rather it is part of a national trend towards increased expenditures on—and employment in—household equipment repairs and personal and professional care. Although not strictly a governmental



FEDERAL, STATE AND LOCAL GOVERNMENT

center, Chicago's third largest non-manufacturing group is made up of government employees. With a projected increase of 18 per cent, governmental workers will keep their rank in 1965; slightly more than three-quarters of the total then will be in state and local government. Employment in *wholesale trade* has

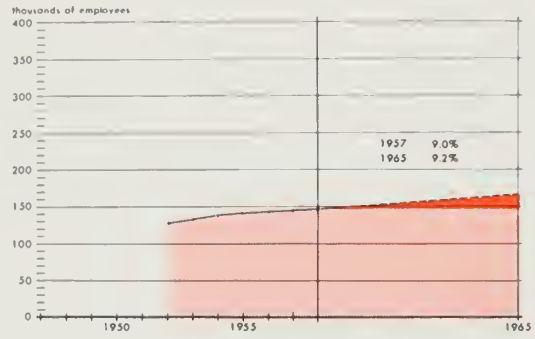


WHOLESALE TRADE

been steadily increasing and will grow by some 12 per cent by 1965; its fourth rank in the non-manufacturing sector reflects Chicago's dominant position in transportation and distribution in the Middlewest.

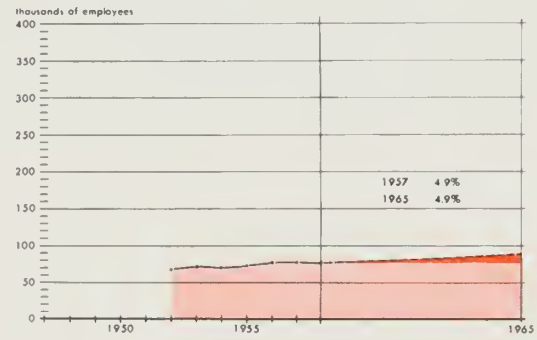
Other Non-manufacturing Activities

The remaining five non-manufacturing activities—in the main, composite groups—suggest Chicago's economic diversity. Three will grow at rates sufficient to keep their current positions within the non-manufacturing structure of the Area: *finance, insurance, and*



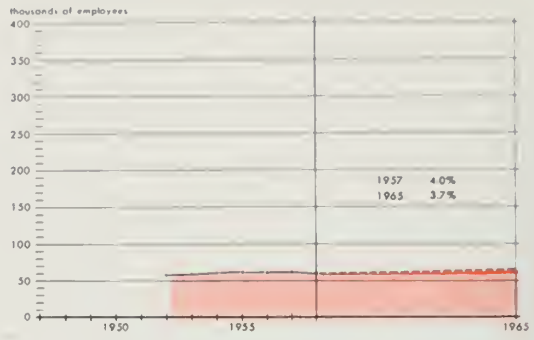
FINANCE, INSURANCE AND REAL ESTATE

real estate; other transportation; and *communications and public utilities.* The first of these has shown remarkable stability in employment since the early 1950's, though it is at present slightly underdeveloped within the Area. The *finance, insurance, and real estate* group should grow by over 15 per cent to 1965 and remain in fifth rank in the non-manufacturing sector. *"Other transportation"* (including trucking,



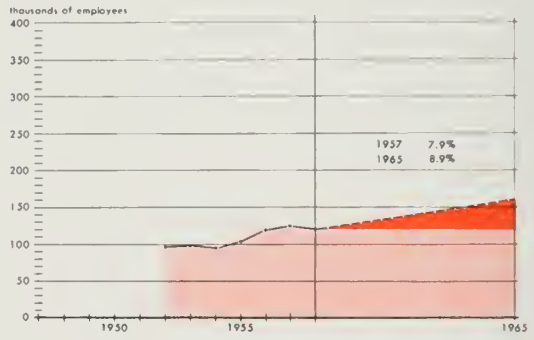
OTHER TRANSPORTATION

water, and air transportation) will continue its modest growth to 1965; only great new labor requirements associated with waterway improvements would accelerate its growth rate in an area already so well served by transportation. The employment growth rate in *communications* has not been as great; this group will drop slightly in relative importance by 1965. In sharp contrast is the steady growth of *contract construction;*



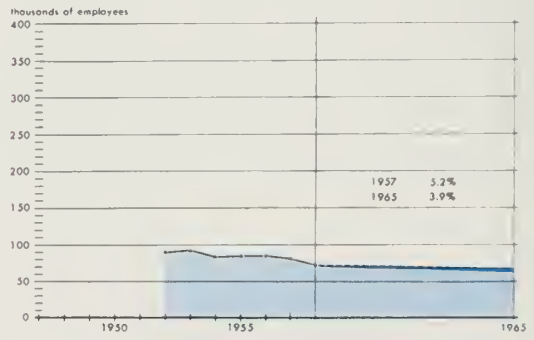
COMMUNICATIONS

with a projected increase of 27 per cent, growth in this field reflects the Area's expanding housing market and



CONTRACT CONSTRUCTION

its general increase in highway, warehouse, and factory construction. The only non-manufacturing group to lose employees by 1965, *interstate railroad and local*



RAILROADS AND BUSLINES

transportation will decline by 14 per cent. That decline suggests changes in labor requirements, rising use of competitors in "other transportation," and continued losses in local mass transit more than it suggests a change in Chicago's transportational importance.

The Waterway-associated Area

Unquestionably, the main industrial concentrations of the Waterway-associated area will continued their recent growth trends up to 1965. Expansion of existing establishments, new industrial building, and recently announced plans in each of the primary centers of economic activity demonstrate the industrial vitality of the Valley area, even without consideration of Waterway improvement. That continuation of present growth trends promises to add some 10 per cent to present manufacturing employment within the nineteen-county area by 1965, when the Waterway-associated district will show a total industrial labor force of some 80,000 workers. (Fig. 4).

Unfortunately, however, statistics are not available to provide an adequate basis for individual industry group predictions, or for estimates of non-manufacturing employment by 1965. Indications are that stone, clay, and glass products, instruments, and food products are leaders in present expansion programs and plans; by 1965—without reference to the impact of Waterway or Seaway improvement—they should have increased their relative proportion of the total manufacturing labor force of the area. In the non-manufacturing sector, retailing will still be dominant in 1965 as a result of the rural-trade orientation of the majority of smaller centers within the nineteen-county area.

Figure 4

THE WATERWAY-ASSOCIATED AREA: MANUFACTURING EMPLOYMENT TREND TO 1965

Present growth trends suggest a 1965 industrial labor force of about 80,000 in the counties bordering the Waterway. This 10 per cent increase will be made up primarily by the expansion of already well-developed industries.

PART III

THE IMPACT OF WATERWAY IMPROVEMENT

Chicago, at the end of the 1950's, stands as the pre-eminent industrial concentration and regional center of the American interior. In diversity of activity, size and wealth of population, and dominance in the basic economic web of the nation, the Chicago Area has only one rival—the larger and older metropolitan New York agglomeration. Chicago has not yet reached its peak; already possessing an importance in manufacturing and non-manufacturing activities far out of proportion to its share of the nation's population, its prospects for growth in both sectors of its economy are bright. By 1965, the labor force of the Area will have grown by at least a quarter of a million, ten per cent above its 1957 level, if no more than current trends are maintained.

A key point in Chicago's past and continuing success is its overwhelming dominance as the transportation center of the nation. To most, that centrality means primarily railroads. They are, of course, basic; but to Chicago's established reputation as the world's most important concentration of railroad facilities must be added its equally valid status as the nation's leading intercity highway freight center, its leading air terminal, and as a primary focus of oil and gas pipelines. Its combination of land and air transportation facilities alone bring to the area a quantity and variety of transportation media almost certainly unsurpassed at any place in the world (Figs. 5 and 6).

But these facilities are not all. At least since their preliminary improvement during the 1930's, the St. Lawrence Seaway and the Illinois Waterway have been integral and important elements in the magnificent transportation structure of the Chicago Area. The Great Lakes, the Welland Canal, and the former lock system of the St. Lawrence River have given the Port of Chicago scheduled service over a direct all-water route to eastern Canada and the world's oceans since 1933. For the same twenty-six years, the Illinois Waterway has provided Chicago and the Waterway-associated areas of Illinois with a barge route to the Gulf of Mexico. Neither route, however, has ever been used to its fullest capacity, even though tonnages over both, except for 1957 and 1958 Seaway traffic, have been increasing sharply in recent years.

The realization of Chicago's full potential as an outstanding continental interior terminal for both deep-draft ocean and inland barge traffic has awaited the more complete improvements of the St. Lawrence Seaway and the Illinois Waterway – improvements just completed or now underway. It is to an assessment of the impact of, particularly, the improved Seaway on the industrial structure of the Chicago Area that Part III of this report is directed.

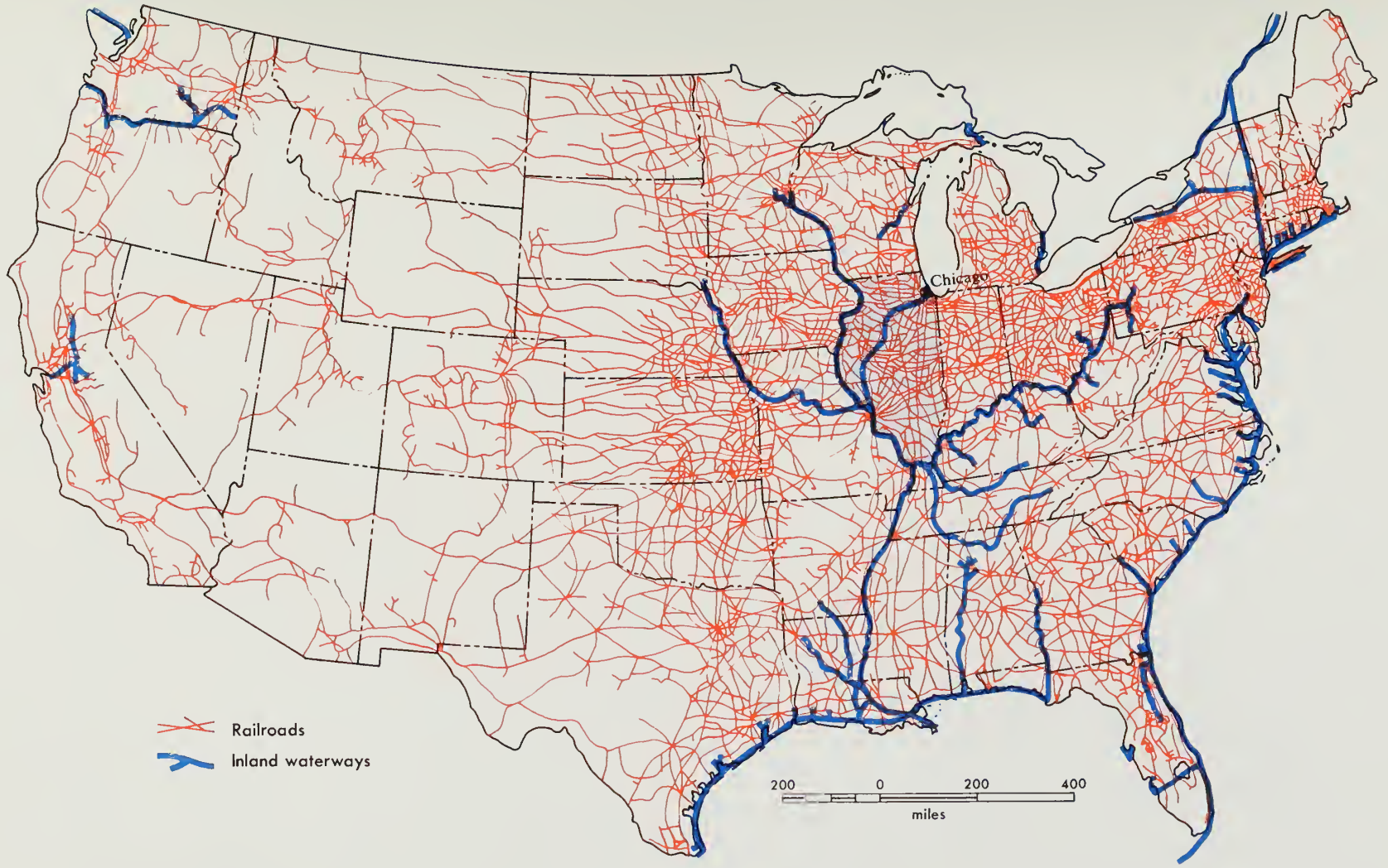
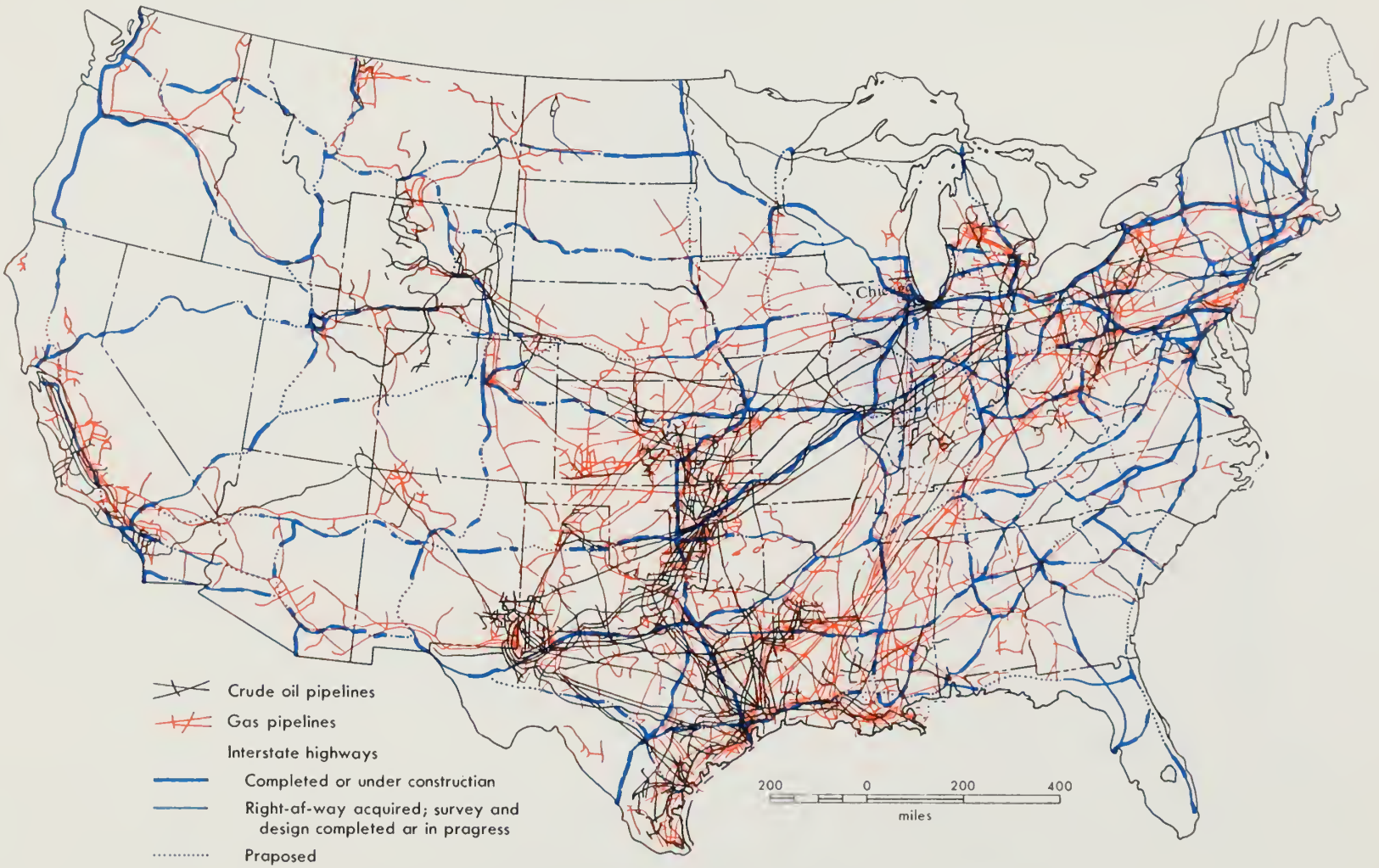


Figure 5

UNITED STATES RAILROADS AND INLAND WATERWAYS

The central position of Chicago and of Illinois in respect to railroad and water transportation is clearly shown on this map. The Illinois-Mississippi-Ohio-Missouri river systems provide barge routes not only to the world's oceans *via* the Gulf of Mexico, but to much of the interior of the United States itself.



UNITED STATES INTERSTATE DEFENSE HIGHWAYS AND PIPELINES

The Chicago Metropolitan Area is one of the major foci of oil and natural gas pipelines which bring immense amounts of industrial materials to the Area. The already superior transportation facilities will be augmented greatly by the Interstate Highway System which will increase the capacity of trucks to move commodities into and out from the Chicago Area and Northern Illinois.

The Impact of Waterway Improvements on the Industrial Potential of Chicago

A major change in the transportation characteristics of any area will set in motion forces which will penetrate through the entire fabric of the area's interrelated industrial structure. The opening to traffic of the improved St. Lawrence Seaway and the promised widening of the Calumet-Sag channel have created such a major change in the transportation characteristics of the North American Midwest. However, the change imposed by the improved St. Lawrence Seaway and the Calumet-Sag is not in number of transportation media but in the quality of service, particularly in the amount of tonnage potential, over two previously available media.

The improvement of an existing facility—or the addition of a totally new one—can have a measurable positive impact upon the economic structure of an area only to the extent that the new condition constitutes a major and identifiable *addition* to the features of that area that are attractive to economic activity. The facility must create a new and different pattern of individual industrial advantages, or its effect will be submerged in a more general pattern of areal economic growth. A major purpose of this report is to identify the types of industry most likely to expand within the Chicago Area and along the Illinois Waterway as a consequence of Seaway improvement.[1] That task requires a detailed assessment of the magnitude and kinds of changes that the deepened St. Lawrence Seaway will bring to the Chicago Area, and an estimate of the significance of those changes to individual industries and groups of industries in the light of the Area's existing industrial - advantage structure and current economic trends.

The prospect for added cargo receipts.— Ocean shipping moves as far into the interior of a continent as possible if opportunities exist to discharge and load cargo. Therefore, even though there are American Lakes ports several days sailing time nearer overseas and Canadian points than is Chicago, (Fig. 7), there are compelling reasons to sail the additional distance to reach the heart of the continent. Chicago is the major market and producing center of the North American Midwest; it has better facilities for receiving and for further distributing waterborne cargo and for the accumulation of goods for export than any other Lakes port; and it is more economical to reach the Chicago market and its products by water alone than by water-land combination. For many commodities such as cutlery, glassware, and machine tools, all-water rates from overseas to Chicago are only 50 cents per long ton higher than to Toledo, Ohio; rail rates on the same goods are about $50, $35, and $22, respectively, per long ton from Toledo to Chicago. Thus, any proposal to land imported goods east of Chicago and to complete the shipment by rail is economically impractical.

To be sure, much of the bulk cargo on the improved Seaway—particularly iron ore from Labrador—will stop short of Chicago; the origin or destination of many bulk commodities lies farther to the east. Fifty per cent of United States steel capacity is located between Pittsburgh and Detroit; a major concentration of chemical industries lies east of Cleveland, and Toledo is a leading coal port. Yet, despite the volume of Seaway bulk traffic to and from the eastern Lakes ports, Chicago will be in the future—as it has been in the past—the most important single port for Seaway-borne traffic. About 40 per cent of all overseas tonnage of previous years moving *via* the St. Lawrence has passed through the Port of Chicago. The conclusion must be reached that at least an equal proportion—some two-fifths—of at least the increased overseas tonnage on the improved Seaway will move to and from the city.

The impact of that increased cargo flow on the economy of Chicago can be evaluated only when it is known what it will *add* to the total freight movement of the Area. Part of the answer depends upon the year-around reliability of freight service; part depends upon the physical capacity of the Seaway to transit

[1]Although not part of the original study, the authors are convinced that recognition of the impending improvement of the Illinois Waterway is integral to any assessment of the impact of the St. Lawrence Seaway. Less study has been given to the Waterway than to the Seaway, but all conclusions reached reflect possible changes created by both improvements.

Figure 7

PORTS-OF-CALL SERVED BY CHICAGO OVERSEAS SHIPPING IN 1959

Direct shipments were made in 1959 to the ports shown on this map. It is anticipated that additional areas in South America and in Africa and the Far East will be served by scheduled service in future years.

1 Havana, Cuba
2 Kingston, Jamaica
3 Cartagena, Colombia
4 Barranquilla, Colombia
5 Maracaibo, Venezuela
6 Willemstad, Curacao
7 Puerto Cabello, Venezuela
8 La Guaira, Venezuela
9 Guanta, Venezuela
10 Port-au-Spain, Trinidad
11 London, England
12 Avonmouth, England
13 Dublin, Ireland
14 Manchester, England
15 Liverpool, England
16 Leeds, England
17 Glasgow, Scotland
18 Aberdeen, Scotland
19 Newcastle, England
20 Middleborough, England
21 Hull, England
22 Stavanger, Norway
23 Bergen, Norway
24 Oslo, Norway
25 Goteborg, Sweden
26 Stockholm, Sweden
27 Helsinki, Finland
28 Gdynia, Poland
29 Malmo, Sweden
30 Copenhagen, Denmark
31 Hamburg, Germany
32 Bremen, Germany
33 Amsterdam, Netherlands
34 Rotterdam, Netherlands
35 Antwerp, Belgium
36 Dunkirk, France
37 Rouen, France
38 Le Havre, France
39 St. Nazaire, France
40 Bordeaux, France
41 Leixoes, Portugal
42 Lisbon, Portugal
43 Cadiz, Spain
44 Tangier, Tangier
45 Casablanca, French Morocco
46 Seville, Spain
47 Algiers, Algeria
48 Alicante, Spain
49 Valencia, Spain
50 Tarragona, Spain
51 Barcelona, Spain
52 Marseilles, France
53 Genoa, Italy
54 Leghorn, Italy
55 Naples, Italy
56 Tunis, Tunisia
57 Trieste, Italy
58 Rijeka, Yugoslavia
59 Piraeus, Greece
60 Istanbul, Turkey
61 Beirut, Lebanon
62 Haifa, Israel
63 Tel Aviv, Israel
64 Alexandria, Egypt
65 Port Sudan, Sudan
66 Damman, Saudi Arabia
67 Al Kuwait, Kuwait
68 Khorramshahr, Iran

vessels; still another part lies in determining how much of the added traffic has significant meaning to Chicago's economy.

During the navigation season, of course, it is assumed that regular schedules can be maintained by ocean liners serving the Lakes ports. However, since the Seaway will be closed to navigation for approximately four winter months of each year, there are definite seasonal limitations on deep-draft cargo receipts at Chicago and at other ports served by the route. This fact alone will cause many prospective shippers to consider carefully the problems — and higher costs — of stockpiling materials and products, or of changing routings of shipments from the Seaway to combination

land-water routes and back again each year. Chicago, of course, does have one distinct seasonal shipping advantage over any other Lakes port: it has year-round barge accessibility to the Gulf of Mexico *via* the generally ice-free Illinois Waterway.

Tonnage capacity as well as seasonal reliability is an important consideration in the evaluation of Seaway impact. There is an inherent limitation on the total tonnage that can transit the Welland Ship Canal and be available for distribution to Lakes ports.[1] The exact capacity of the Canal is still a point of dispute among authorities, yet it is essential that some conclusion be reached to permit an estimate of the amount of new traffic that will be added to the Chicago Area, particularly the new traffic that can be expected to benefit (or harm) manufacturing industry.

Both the capacity of the Welland Canal and the composition of its prospective traffic are points at issue. Various estimates have been published concerning the average size of vessels to use the Seaway, the amount of Labrador iron ore moving to Lake Erie ports, the total flow of eastern Canadian commodities—particularly pulp—and the future of coal and petroleum movements to Canada.[2] Without here repeating the various lines of argument, the authors estimate that—granting the present capacity of the Welland Canal and the full twenty-seven foot channels linking the Lakes—an absolute maximum of just over 6,000,000 tons of new Seaway traffic will be available for industrial use at the Port of Chicago by 1965.[3]

The capacity of the Welland Canal to transit new shipping is estimated as follows:[4]

Total capacity of Canal (estimated)	50,000,000 short tons
Less tonnage moved through Welland Canal (1957) prior to opening of improved Seaway	22,372,538 short tons
New tonnage (estimated)	27,627,462 short tons

Thus, about 27,600,000 tons of *new* cargo not previously available to ports above the Welland Canal are the maximum that can be expected to move to and from the ports of Lakes Erie, St. Claire, Huron, Michigan, and Superior.

The composition of the new traffic transiting the Welland is also under dispute by competent authorities. The movements of bulk cargo are particularly at issue. Some experts have suggested that by 1965 more than 10,000,000 tons of Labrador iron ore alone will enter the Lakes. Limitations on Labrador ore production and commitments to United States seaboard mills will limit Labrador ore traffic on the Lakes. We believe a more realistic estimate would be 7,000,000 tons a year; so because about 2,600,000 tons transited the Canal in 1957, 4,400,000 tons of the new traffic total will be upbound iron ore. Little or none of that Labrador ore will reach Chicago.

Certainly, additional large tonnages of bulk cargo—adding little to the materials for manufacture—will move outbound. Here, again, estimates vary widely. For bulk grain, 1965 predictions range from 6,500,000 tons to 12,000,000 tons (between 5 and 6 million tons have moved downbound through the Welland Canal in recent years). If an estimate of 8,000,000 tons be adopted for 1965 Seaway

[1]The same may be said about the St. Lawrence Locks, but their capacity is greater and the critical point for traffic destined beyond Lake Ontario is the Welland Ship Canal.

[2]One of the best summaries of various aspects of Seaway problems is "The 8th Sea," reprinted from *Traffic World*, October 19, 1957.

[3]This estimate does not include increased tonnages moving over an improved Illinois Waterway, nor does it include added shipments of grain and certain in-transit bulk commodities, estimated to total about 2,500,000 tons.

The Seaway industrial tonnage estimate represents an increment of between one and two per cent to the *present* total traffic flow of Chicago.

The 1957 inbound and outbound traffic of Chicago alone was about 350,000,000 tons, distributed as follows (figures rounded):

Total Traffic of Chicago, 1957, in short tons (2,000 lbs.)

by rail, not including coal[a]	117,500,000
by rail—coal only	8,000,000
by Illinois Waterway barge	15,000,000
by Lakes carriers	60,000,000
by truck	92,710,000
by pipeline[b]	54,325,000
by air	122,650
by overseas shipping	326,650
Total	347,984,300

[a]Based on originations only; total assumed to be twice the volume of originations.

[b]Based on average capacities of pipelines.

[4]Data on actual Welland Ship Canal tonnages are from: Canada, Dominion Bureau of Statistics, *Canal Statistics*, (Ottawa, 1958), Table 16. Estimates are ours. 1957 traffic was slightly below that of 1956. 1958 traffic was still lower.

grain movement, another 3,000,000 tons must be subtracted from the industrial potential of new traffic (8,000,000 tons in 1965 minus 5,000,000 tons in 1957). Tonnages of coal, coke, and crude petroleum (in addition to the 6,500,000 tons downbound in 1957) for direct export to Canada, will subtract perhaps another 2,000,000 tons. On the basis of past experience, about 10 per cent of all Welland tonnage will be intra-Canadian or Canadian-overseas movement other than that of grain and petroleum;[1] applied to the *new tonnage* total of 27,600,000 tons, this would amount to nearly 2,800,000 tons which must also be deducted from the anticipated total new Seaway movement available to American industry.

Of the original estimate of about 27,600,000 tons of *new* cargo into the Lakes above Lake Ontario over the improved St. Lawrence Seaway by 1965, therefore, only 15,400,000 tons (Table IV) remain as effectively available new bulk and general cargo that will provide for product exports, added raw or semi-finished materials and components for industry, or imported products to compete with domestic manufactures. Much of this tonnage will be composed of paper, pulp, and other goods from eastern Canada—of which Chicago industry will, of course, receive a share—and the rest will arrive from or be consigned to American coastal or overseas points. If Chicago receives 40 per cent of this adjusted total of 15,400,000 tons of new shipping (a percentage that is approximately Chicago's past share of overseas Seaway traffic)[2] there will be capacity to move about 6,000,000 additional tons of industrially significant materials and products into and out of the Chicago Area.

On the basis of past experience, the most important new traffic for Chicago industries will comprise general cargo movements, and in this regard Chicago's prospects differ from

TABLE IV

ESTIMATED AVAILABILITY OF NEW INDUSTRIAL TONNAGE *(short tons)* AT PORT OF CHICAGO *via* WELLAND CANAL BY 1965

Total new tonnage above Lake Ontario		27,600,000
Less tonnage not useful to Chicago industry (see text):		
Iron ore	4,400,000	
Grain	3,000,000	
Coal, coke, petroleum	2,000,000	
Canadian traffic	2,800,000	12,200,000
Total new bulk and general cargo other than above		15,400,000
Estimated absolute maximum share Chicago will receive (40 per cent)		6,160,000

those of most other major Lakes ports. General cargo, according to estimates of Seaway officials, may comprise as much as 15 to 20 per cent of the added 1965 Seaway tonnage, or up to some 5,000,000 tons of the anticipated 27,600,000 ton increase. If 40 per cent of this new general cargo originates or terminates at the Port of Chicago, about 2,000,000 tons, or about one-third of all new tonnage, will be general cargo; this would represent an increase of 600 per cent over the 1957 overseas general cargo traffic of the Port.

These estimates, of course, give no indication of the anticipated composition of the new overseas traffic of Chicago. A study of commodities passing through the Port of Chicago between April and July, 1959, has indicated the nature of cargo movement during the first few months of improved Seaway operation. Among the important exports were: grain and processed agricultural goods, metal products, machinery (agricultural, industrial, construction, and vending), chemicals, clay, and asphalt. Imports included: toys, glass and chinaware, steel, hardware, tools, wood products, sewing machines, automobiles, chemical products, hides and leather products, and canned foods. The import list is particularly interesting, for it suggests the types of goods which appear to have the greatest market potential in the Midwest and which may compete most seriously with American products. Chief among those would appear to be steel mill products—moving into Chicago in much larger volumes than in previous years, primarily from Belgium—and basic hardware and tools, up considerably from previous years.

[1] In 1957 about 6 million tons of Welland Canal traffic, 27 per cent of the total of more than 22 million tons, moved between Canadian ports or between Canadian ports and overseas destinations. Of this, about 4,000,000 tons were grain and petroleum.

[2] Eastern Canada, of course, is not an overseas destination. However, since no figures are readily available on shipments between individual American Lakes ports and eastern Canada, and since Chicago is known to receive a considerable share of such shipments, the city's share of overseas traffic was used as an estimate of the distribution of this traffic as well.

Imports of foreign cars and wood products are also up.[1]

The prospect of industrial change. — Although the anticipated increase in Seaway traffic by 1965 can add only about two per cent to the Chicago Area's total freight movement, even that modest increment presents opportunities for industrial growth and expansion within the Area. However, the growth of any economic activity is not inevitable. As is true in any such situation, among the uncertainties is the extent to which the managers of industry and commerce will decide to use the opportunities presented by the extension of deep-water shipping to the southwestern extremity of the Great Lakes. We are concerned here with possibilities, not certainties; decisions lie in other hands.

Nevertheless, those decisions—important to Chicago and to Illinois—will be based upon practical considerations of the extent to which the new Seaway will alter the industrial attractiveness of the Chicago Area, create a new pattern of market possibilities, and give rise to a new transportation-cost structure.

Expansions of industry in the Chicago region, represented by the investment of additional capital or the establishment of a new industrial type here, require management decisions on probable future economies of operating in the Metropolitan Area or along the Waterway. The final locational decision is seldom based entirely upon quantitative, demonstrable evidence, yet it is axiomatic that production requirements as reflected in industrial costs are the core data upon which initial locational decisions are made.

The production requirements of modern industry are enormously complex and varied; yet, there are a few shared by all. One of these is access to transportation, because industries do not manufacture products from materials all obtainable at one place, nor do many market all their products at the place of manufacture. The probability of success of every existing industrial plant and of every potential plant site is — with some modifications — dependent on its economical accessibility to materials, services (including labor), and markets. No major manufacturing area exists without having several media of transportation; most have, in one way or another, access to water transportation. To the extent that Seaway and Waterway improvements enhance the transportational advantages of Chicago, to that same extent is the industrial attractiveness of the Area increased.

The attractiveness of Chicago for industrial development is indisputable; its long history of industrial growth and its current manufacturing trends are ample demonstrations. To the Area's present attributes and attractions, the improved Seaway and Illinois Waterway will make obvious — but minor — additions. Chicago is already the major port for internal and foreign traffic on the Great Lakes and will be the probable terminal and initial port for much of the overseas traffic through the Seaway. Chicago has, as well, the largest and most diverse supporting region of any Great Lakes city (Fig. 8) and so stands to benefit most from Seaway improvement.[2] Improvements in the Calumet-Sag connection between the Illinois Waterway and Lake Calumet (Chicago's industrial port) —scheduled for completion in 1963 or 1964—will greatly increase the effectiveness of both the Waterway and the Seaway in the transportation structure of Chicago and northern Illinois.

Neither Seaway nor Waterway improvement will increase the number of transportation media available to the Chicago Area; it has been pointed out earlier that both routes have long been part of the City's long-distance traffic structure. What will be added is an increase in potential capacity of carriers on these low-cost water routes. For the first time, the amount of waterborne cargo entering the City can reach such volumes as to make water carriers effective competitors to overland media. The increased effective capacity of the Seaway is due largely to the increased size and loading of vessels permitted by the deeper channel and to the more frequent scheduled sailings now promised. The straightening, widening, and deepening of the Illinois Wa-

[1]A detailed analysis of changes in the composition of Seaway traffic between former years and the 1959 navigation season appears in Volume II of this report.

[2]Volume II of this study contains an analysis of the economy of Chicago's area of Freight Rate and Shipping Advantage shown on Fig. 8.

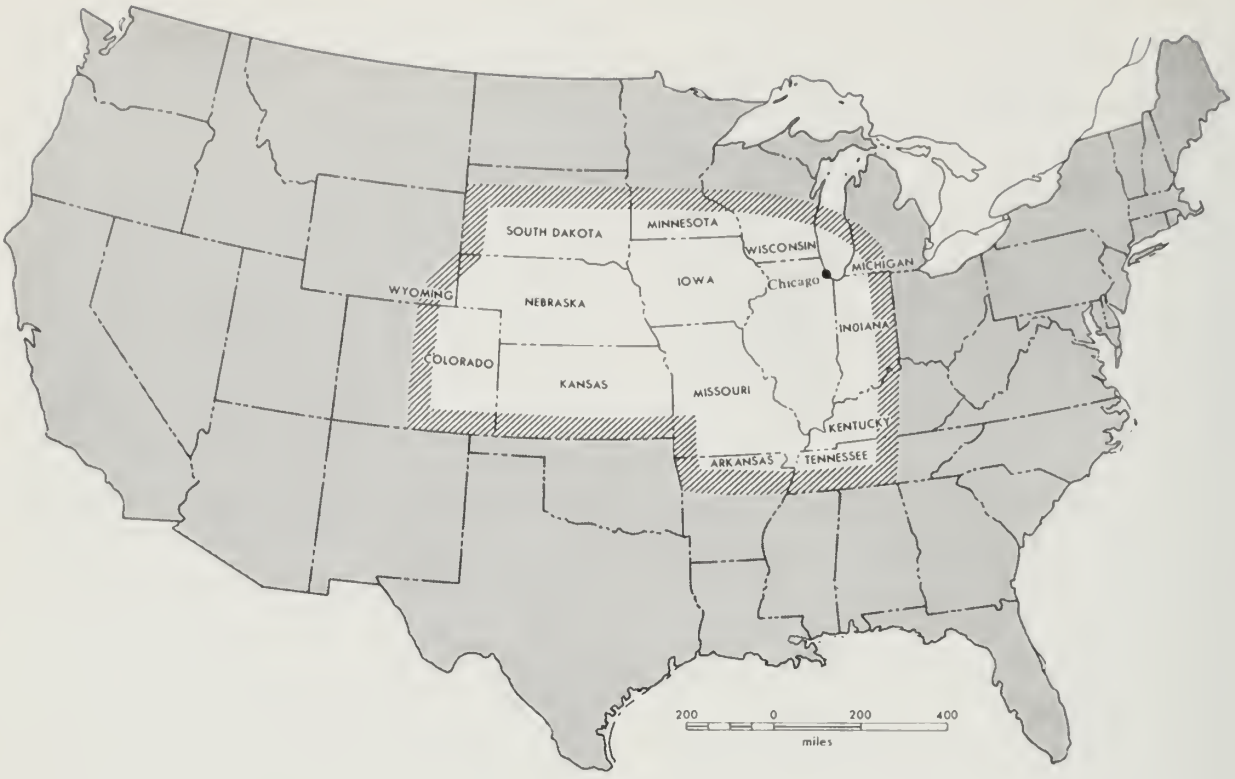


Figure 8

CHICAGO SUPPORT AREA OF FREIGHT RATE AND SHIPPING ADVANTAGE

This area, the heart of the North American Midwest, is the region which is most readily accessible to Chicago by virtue of low rail freight rates or direct shipping routes. The boundaries of the area were established in Export Traffic, Port of Chicago, by the Chicago Association of Commerce and Industry, January, 1959.

terway link will increase the size of tows and speed up two-way movement. Instead of about 1,600 ton capacity limits for overseas carriers, the Seaway will now permit cargoes of 8,000 to 9,000 tons; the two-to-three barge trains now brought through the Calumet-Sag system will be replaced by tows many times larger. The economies inherent in utilizing such greatly enlarged units of low-cost water transportation hold promise for industries requiring facilities for accumulation of bulk materials or making large unit shipments of products.

A new, although not materially altered, pattern of market possibilities may be expected to follow Seaway and Waterway improvement. Economic accessibility to markets is in part contingent upon the size of shipments that can be made, and changes in the waterways will alter at least that aspect of Chicago's marketing structure. In this respect, however, any major Lakes port may expect to suffer as well as to benefit; not only will world markets be more accessible, but also will foreign producers become more active competitors in the Middlewest. At the same time, foreign marketing prospects are not necessarily those usually envisioned:

> A . . . serious obstacle presenting itself is the levelling off, if not decline, of the European market for United States goods. The St. Lawrence route points nearly directly to Western Europe. Lake Erie ports are no further from there than are the Atlantic ports. This is the only overseas market area of the world to which the St. Lawrence route presents definite savings in distance. To other areas the transportation savings must come mostly from differing inland rail or truck rates. The European *common market* plan will mean that fewer United States exports can be sold there unless the plan brings so much prosperity to Europe that its demand for imports will pick up again. A large proportion of the manufac-

tured goods moving out through the Seaway will have to be headed for the Caribbean, South America, Africa, and the Middle East. Such a shift from European markets might occur naturally because these other areas represent potential sources of raw materials for Midwest industry.

The Seaway will, of course, open up the Midwest to a stream of foreign manufactured goods. Already considerable quantities of both producers' and consumers' goods are flowing in through Great Lakes ports. . . . Buyers will benefit; there can be no doubt of that. But what about domestic manufacturers of identical or competing products? All that can be said is that, if they export to overseas areas, they receive the same advantage from the Seaway as do their foreign-based competitors who ship goods into the United States.[1]

These conditions—the decreasing competitive advantage of American products in overseas markets and the increased advantage to overseas manufacturers in Midwestern markets—add a note of caution to estimates of the possibilities of expansion of industries in Chicago and northern Illinois. The composition of foreign cargo receipts at Chicago during the first few months of improved Seaway operation lends added emphasis to that warning.

The chief long-range beneficial impact of the improved Seaway and Waterway on the Chicago Area may well come indirectly as a result of favorable changes in the over-all transportation-cost structure of the Area. The enhanced competitive position of both Seaway and Waterway will favorably affect the cost and feasibility of material accumulation and the cost and prospects of product distribution.

The improved transportation-cost structure of Chicago and the Waterway-associated area will not necessarily result from a reduction of waterborne freight rates themselves. Rates, including tolls, on the improved St. Lawrence Seaway are at approximately the same level as they were on the former Great Lakes-to-overseas passage. Nor is it anticipated that barge rates on the Illinois Waterway *via* the improved Calumet-Sag will be appreciably below those now in effect. Rather, the transportation-cost benefit to Chicago will come from the reduction of freight rates on the higher-cost land transport media facing effective waterborne tonnage competition for the first time. It is anticipated that many commodities will move at less cost over the highways and rails radiating from Chicago when that competition is felt.

Because of obvious uncertainty about the volume and composition of traffic over the Seaway, the competitive reactions of railroad and truck lines are not yet clearly established. As a result, instability in freight rates on many commodities exists at the present time. Some rail rates on bulk commodities for export through east and south coast ports have already changed drastically; other rate changes will certainly follow.[2] Still further uncertainty exists. The impact of meeting Seaway shipments from and into the Midwest is quite different on the Eastern, the Western, and the Southern carriers; indeed, it is different among the lines that serve the same areas. These uncertainties make it impossible to predict with any precision future comparative rates.

Nevertheless, planned and announced rate changes provide the justification for making a general assumption on *levels* of freight rates, particularly in their relationship to other industrial costs. It is assumed that overland freight rates in all areas served by the St. Lawrence Seaway and by the Illinois Waterway will be reduced relative to those in other parts of the United States on certain bulk commodities and, possibly, on general cargo goods as well. Thus, transportation rates on all competing media—water, rail, and truck—will be at a level that will permit certain goods to be accumulated at Chicago and along the Illinois Waterway, and distributed from those areas, at a lower relative cost than was formerly the case. These reductions will have an impact on total production costs of industries in these areas, on their export and import trade possibilities and, perhaps, also on purely domestic commerce.

[1]Donald F. Wood, "The St. Lawrence Seaway: Some Considerations of Its Impact," *Land Economics,* Vol. 34 no. 1 (Feb. 1958), pp. 68-69.

[2]Appendix A of this report contains a brief discussion of rate changes and trends pertinent to this study.

It is within the field of competitive rate costs that the greatest long-range change in Chicago's existing pattern of industrial attractiveness will occur, and the greatest impact of the improved Seaway and Waterway will be felt. However, the shorter-range possibilities for industrial growth or decline, by about 1965, presented next in this study, have been developed with greater emphasis on the direct results of improvements in the two waterways.

Industrial Impacts of Improved Water Transportation

All manufacturing industries require a great variety of materials, facilities, and services. The sensitivity of different types of industry to each of these needs varies; few industries are unusually sensitive to more than three or four of them, and the critical elements vary among different industries. In a like manner, there is a wide and unavoidable variation in the abilities of alternative locations to supply the needs of any particular industrial type. For any selected group of industries, however, their varying critical needs can be categorized into major and minor requirements; the ability of any specific area to satisfy at least the major locational requirements can be summarized in a series of Industrial Cost Patterns (Table V).

Industrial Cost Patterns of Chicago.—The cost patterns which characterize the flourishing industries of an area can reveal much about the industrial advantages of that area. The combination of existing successful industries within a single community in a sense summarizes a whole series of appropriate decisions by managers concerning the ability of their industries to operate within the cost patterns prevailing within the community.

There are three geographical choices that the management of a specific industrial organization must make before the investment of capital in expanded or newly located plant and equipment takes place. These geographic choices are: in which general region, in what community, and on what exact site shall the investment be made?

It has been pointed out earlier that, although the final locational decision is seldom based entirely upon quantitative evidence and there is a large measure of managerial discretion involved in each of the three elements of locational choice, the costs of meeting industrial requirements are the core data upon which locational decisions are made. The total net cost, not including profit, of a manufactured article delivered to a customer is the sum of a very large number of individual expenditures for such items as material, labor, taxes, interest, water, power and fuel, distribution, transportation, and many others. These individual costs can best be combined —in the analysis of locational decisions—into:

1) The costs of accumulating all of the materials and services required for the manufacturing operations at the plant location. Included in this cost category are the cost of production of materials and services at their points of origin and the cost of transporting the required materials from points of origin to the plant location.

2) The costs of converting the materials into products at the plant site and all other costs consequent upon operation at that site. Included are costs of land and rent, capital equipment, inventory, labor, taxes, insurance, depreciation, local utilities, waste disposal, and others.

3) The costs of distributing the products from the plant location to the market places. These include transportation cost, time-in-transit, variability in capacity of markets, and the costs of packaging, advertising, and other sales expenditures.

Individual and total costs — summarized above—vary from industry to industry, from place to place, and from time to time. Of these costs, only a limited number are critical in the industrial locational decisions of most industries.

We are concerned here with the Chicago Area and with the contemporary patterns of industrial costs displayed there. Table V is designed to summarize the industrial cost considerations critical to establishments now operating within the Chicago Area and to present the factual background necessary for the evaluation of the expansion potential of

Figure 9

CHICAGO STANDARD METROPOLITAN AREA AND CHICAGO RATE BASE AREA

Two additional counties, McHenry in Illinois, and Porter in Indiana have been added to the Chicago Metropolitan Area shown on this map, but, because data are not yet available for the larger Area, the six-county Area is used as the Chicago Metropolitan Area throughout this report. The Chicago Rate Base Area is the region into which rail freight rates are the same in all parts.

those existing industries and of industries with the same industrial cost demands.

Table V lists 86 of the most important industrial types found in the Chicago Rate Base area[1] (Fig. 9) according to the Industrial Cost Pattern into which each industry has been placed. The first four columns of Table V show the percentage of the value of total shipments made up by cost of payroll (column 1), raw materials (column 2), purchases from other manufacturing industries (column 3), transportation (top figure, column 4), and utilities (bottom figure, column 4). Column 5 summarizes the transportation-cost sensitivity of each industry according to the categorization explained in the legend to Table V. Column 6 shows the percentage of all transportation costs made up by water transportation, while columns 7 and 8 show the abilities of selected industries to serve the population within Chicago's Freight Rate and Shipping Advantage area (Fig. 8)[2]. Column 9 indicates the authors' conclusions about the impact of the Seaway, of the improved Illinois Waterway, and of other influences on each industry listed.

[1]The industries analyzed in this section are taken from among those described by Arthur Longini in his *Chicago-Chicago Heights Industrial Economic Blueprint* (Chicago: Chicago and Eastern Illinois Railroad, 1956). The Chicago Rate Base area used in the Longini study does not coincide with the Chicago Standard Metropolitan Area (Fig. 9); however, the wide range of industries within the Rate Base area makes it representative of the industrial structure of the larger Metropolitan Area. Much use has been made in this report of Longini's estimates of industrial costs.

[2]See Appendix B for a discussion of the "population served" method of analysis.

LEGEND FOR TABLE V

Column 1—Cost of Payroll as percentage of Value of Total Shipments, 1955. Adapted from data in *Chicago-Chicago Heights Industrial Economic Blueprint* by Arthur Longini (Chicago and Eastern Illinois Railroad, 1956).

Column 2—Cost of Raw Materials as percentage of Value of Total Shipments, 1955. Adapted from data in *Chicago-Chicago Heights Industrial Economic Blueprint.*

Column 3—Cost of Purchases from Other Industries as percentage of Value of Total Shipments, 1955. Adapted from data in *Chicago-Chicago Heights Industrial Economic Blueprint.*

Column 4—Cost of Transportation (upper figure) and Utilities, (lower figure) as percentages of Value of Total Shipments, 1955. Adapted from data in *Chicago-Chicago Heights Industrial Economic Blueprint.*

Column 5—Transportation-Cost Sensitivity of Industries Operating in Chicago Area.[1]

I. Not sensitive to transportation costs; transportation costs not more than 2% of payroll and material costs.

II. Slightly sensitive to transportation costs; transportation costs between 2% and 5% of payroll and material costs.

III. Moderately sensitive to transportation costs; transportation costs between 5% and 10% of payroll and material costs.

IV. Very sensitive to transportation costs; transportation costs greater than 10% of payroll and material costs.

Column 6—Cost of Water Transportation as percentage of All Transportation Costs, 1955. Adapted from data in *Chicago-Chicago Heights Industrial Economic Blueprint.*

Column 7—Deficient Production in Chicago Supporting Area (Fig. 8).[2]

I. More than 20,000,000 population not served; area presumed to lack vital locational requirements for the industry.

II. 15,000,000-20,000,000 population not served; most of area presumed to lack vital locational requirements for the industry.

III. 10,000,000-15,000,000 population not served; area presumed to have some of the locational requirements for the industry.

IV. 5,000,000-10,000,000 population not served; area presumed to have most of the locational requirements for the industry.

V. 0-5,000,000 population not served; area presumed to have all of the major locational requirements for the industry.

Column 8—Excess production in Chicago Supporting Area (Fig. 8).[2]

I. 0-5,000,000 excess population served; industry presumed to have good expansion possibilities in area.

[1]Industries having narrow profit margins are raised one category in Table V.

[2]See Appendix B for discussion of "population served" technique.

II. 5,000,000-10,000,000 excess population served; industry presumed to have good expansion possibilities in area.

III. 10,000,000-15,000,000 excess population served; industry presumed to have good expansion possibilities in area.

IV. 15,000,000-20,000,000 excess population served; area industry a primary source of United States supply, industry will expand "naturally."

V. More than 20,000,000 excess population served; area industry a major source of United States supply, industry will expand "naturally."

Column 9—Conclusion on impact of improved water transportation:

I. Industry's growth trend may be accelerated by improved water transportation.

II. Industry may grow without reference to improved water transportation.

III. Industry may remain relatively stable.

IV. Industry's trend to decline may be arrested by improved water transportation.

V. Industry may decline without reference to improved water transportation.

VI. Industry may decline because of improved water transportation.

TABLE V

MAJOR INDUSTRIAL COSTS OF SELECTED CHICAGO INDUSTRIAL TYPES

Pattern I

Major Costs are for Transportation, Labor, Materials and/or Water

Industry Type and Standard Industrial Classification Number	1 %	2 %	3 %	4 %	5	6 %	7	8	9
Automotive Equipment and parts. 3714	22.2	0.1	52.8	1.9 0.4	II	3.9	V	—	II
Wood Furniture. 251	36.5	0.1	40.3	3.6 0.5	II	3.1	—	II	V
Metal Furniture. 3514, 3522	35.0	0.1	49.5	1.6 0.6	II	3.8	—	—	II
Millwork. 2431	29.8	8.5	30.2	5.0 0.4	III	3.9	—	I	II
Fabricated Wood Products. 249	23.2	—	35.0	7.6 0.6	IV	2.8	III	—	II
Wood Containers. 244	27.5	—	47.6	8.0 0.6	IV	2.1	—	—	IV
Tanning and Finishing Leather. 311	30.8	1.2	52.5	4.9 0.4	III	2.4	—	—	IV
Wood Partitions, Shelves, Office and Store Fixtures. 2541	26.9	0.1	42.8	2.9 0.5	II	2.9	—	I	II
Paperboard Boxes and Containers. 265	24.3	0.2	65.2	4.4 0.5	III	3.1	—	—	I
Beverages. 2086	26.8	9.7	30.1	3.3 0.4	III	2.1	—	—	II
Agricultural Machinery & Tractors. 352	35.7	0.1	42.4	1.6 0.5	II	—	—	V	III
Locomotives. 3741	34.8	0.1	48.9	1.1 0.3	II	4.2	—	II	III
Railroad Cars. 3742	35.7	0.1	47.7	1.8 0.3	II	3.5	—	II	III
Rubber Products. 306	24.8	0.3	42.4	1.6 1.0	II	4.5	IV	—	I
Plastic Materials. 2821	34.8	0.4	57.7	3.3 0.7	II	12.3	—	—	II
Electrical Equipment for Engines. 3694	33.0	—	43.5	1.7 0.9	II	6.0	—	—	II
Boiler Shop Products. 3443	20.6	0.1	53.8	0.7	II	4.1	—	—	III
Fabricated Structural Metal Products. 344	27.5	0.1	45.6	1.6 0.5	II	4.4	—	—	II

TABLE V (Continued)

Pattern 2

Major Costs are for Transportation, Labor, Fuels and/or Power, Materials and/or Water

Industry Type and Standard Industrial Classification Number	1 %	2 %	3 %	4 %	5	6 %	7	8	9
Structural & Heat Resistant Clay Products. 325	40.4	12.5	5.4	4.5 3.6	III	4.5	—	II	I
Pottery & Related Products. 326	39.5	3.5	14.0	3.5 —	III	4.4	III	—	VI
Cement. 324	28.6	11.4	8.6	10.9 5.7	IV	6.8	V	—	III
Gypsum & Concrete Products. 327	33.3	7.7	34.7	11.0 1.9	IV	4.3	—	—	II
Treated Minerals and Earths. 3295	36.7	19.1	16.1	9.2 2.0	IV	5.5	—	—	I
Glass Products from Purchased Glass. 323	28.2	1.3	22.2	3.1 2.5	III	5.9	IV	—	III

Pattern 3

Major Costs are for Materials and/or Water

Industry Type and Standard Industrial Classification Number	1 %	2 %	3 %	4 %	5	6 %	7	8	9
Electric Appliances. 363	18.6	0.1	52.1	1.3 0.4	I	3.9	—	V	II
Animal Fats and Oils. 2094, 2095	12.8	2.0	58.1	1.1 0.4	I	3.4	—	—	IV
Textile House Furnishing Materials. 227	17.9	0.2	54.4	1.4 0.3	I	20.8	—	—	V

TABLE V (Continued)

Pattern 4

Major Costs are for
Transportation, Fuels and/or Power, Materials and/or Water

Industry Type and Standard Industrial Classification Number	1 %	2 %	3 %	4 %	5	6 %	7	8	9
Inorganic Chemicals. 281	20.6	9.8	28.9	5.5 2.3	III	8.8	III	—	I
Organic Chemicals. 281	12.8	3.7	51.0	4.2 1.9	III	12.7	III	—	I
Petroleum Refining. 291	13.4	53.8	13.1	7.3 0.7	III	20.7	—	II	II
Blast Furnaces, Steel & Rolling mills. 331	21.2	25.4	46.3	4.8 1.0	III	19.0	—	I	II
Paper & Paperboard. 262, 263	14.4	2.1	36.4	4.2 1.1	III	11.5	—	I	I
Spinning, Weaving & Dying Cloth. 22	14.6	22.0	24.3	2.1 0.8	II	3.5	I	—	V
Drugs & Medicines. 283	17.5	2.7	40.8	2.4 0.9	II	15.6	—	V	II
Paving & Roofing Materials. 295	14.2	1.3	61.0	5.9 0.7	III	9.7	—	—	VI
Abrasives. 3291	16.9	2.7	39.5	1.4 0.8	II	4.0	—	—	I
Fertilizer. 2871	21.2	11.0	45.8	12.5 0.7	IV	8.8	—	—	I
Asbestos. 3292	20.7	8.5	39.5	3.6 0.8	III	7.8	—	—	I
Non-Ferrous Metal Rolling & Drawing. 335	10.0	0.1	64.0	1.4 0.8	II	2.4	V	—	I

TABLE V (Continued)

Pattern 5

Major Costs are for Transportation, Materials and/or Water

Industrial Type and Standard Industrial Classification Number	1 %	2 %	3 %	4 %	5	6 %	7	8	9
Soaps & Cleaners. 284	18.1	0.9	61.6	2.9 0.4	II	7.6	—	V	III
Grain Milling. 204	7.3	34.1	19.8	7.0 0.5	IV	2.7	—	V	III
Canning & Freezing of Foods-prepared. 203	17.0	31.1	35.4	2.4 0.4	II	2.8	—	—	II
Paints, Varnishes, Lacquers. 285	17.1	4.5	57.8	2.9 0.7	II	8.4	—	III	III
Tin Cans. 341	18.4	—	66.5	2.9 0.6	III	3.9	—	IV	II
Vegetable Oils. 2091, 2092, 2093	3.6	34.4	38.5	2.4 0.4	II	2.2	—	—	I
Meat Packing. 201	17.6	58.0	9.9	2.2 0.4	III	1.6	—	V	IV
Special and Fabricated Textiles. 229	19.1	6.5	26.3	3.3 0.4	II	20.8	I	—	V

Pattern 6

Major Costs are for Labor, Materials and/or Water

Industry Type and Standard Industrial Classification Number	1 %	2 %	3 %	4 %	5	6 %	7	8	9
Radio & Television. 3651	28.3	0.2	44.8	1.6 0.6	II	3.8	—	—	II
Telephone & Communications Equipment. 366	28.0	0.2	48.0	1.5 0.8	I	4.4	—	V	II
Engines & Turbines. 351	37.1	0.1	45.1	1.4 0.4	I	—	IV	—	III

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TABLE V (Continued)

Pattern 6 (Cont'd)

Major Costs are for Labor, Materials and/or Water

Industry Type and Standard Industrial Classification Number	1 %	2 %	3 %	4 %	5	6 %	7	8	9
Construction, Mining, and Oil Machinery. 353	26.7	0.1	51.9	1.4 0.6	I	4.6	—	II	I
Pumps & Compressors. 3561	23.2	0.2	49.7	1.3 0.5	I	5.0	—	—	II
Electrical & Other Industrial Machinery. 362	22.7	0.1	48.8	1.3 0.5	I	5.8	—	—	II
Refrigeration Equipment. 3585	28.7	—	50.9	1.6 0.5	I	4.4	—	—	II
Generators & Motors. 3621	35.2	—	48.0	1.5 0.8	I	5.0	—	—	VI
Heating Equipment. 3433	26.7	0.1	45.1	1.4 0.6	I	3.6	—	II	II
Metal Stampings. 346	29.4	0.1	47.4	1.4 0.6	I	4.6	—	II	I
Lighting Fixtures. 3499	25.0	0.1	45.6	1.4 0.6	I	4.6	—	—	V
Toys & Sporting Goods. 394	25.6	0.1	47.3	1.2 0.7	I	5.6	V	—	II
Special Industry Machinery. 355	32.9	0.1	39.8	1.2 0.5	I	5.5	I	—	IV
Elevators & Conveyors. 3534, 3535	30.5	—	42.0	1.0 0.6	I	5.3	—	—	III
Fabricated Wire Products. 348	24.4	0.1	54.6	0.7 0.3	I	4.3	—	III	VI
Watches & Clocks. 387	35.3	—	40.4	0.7 —	I	2.6	—	V	III
Apparel. 23	32.7	2.3	51.5	0.9 0.5	I	1.7	IV	—	V
Footwear. 314	35.9	—	46.7	1.3 0.4	I	2.8	—	III	V
Commercial Machinery & Equipment. 357	41.2	0.2	38.6	1.1 0.8	I	5.7	—	II	III
Hardware. 3429	30.0	0.2	40.0	1.3 0.7	I	4.4	—	—	VI
Plumbing Supplies. 3431, 3432	31.3	0.2	40.5	1.4 1.0	I	6.5	—	II	II
Aircraft & Parts. 372	31.7	—	41.8	1.2 1.0	I	4.3	I	—	V
Non-Ferrous Metal Foundries. 336	43.7	0.2	35.9	1.4 1.0	I	4.2	—	II	I
Bakeries (Hard-goods). 2052	33.5	1.6	45.6	3.5 1.0	II	2.0	—	—	II
Iron & Steel Forgings. 3391	32.0	0.3	45.5	1.3 0.7	I	8.7	—	II	I

TABLE V (Continued)

Pattern 7

Major Cost is for Labor

Industry Type and Standard Industrial Classification Number	1 %	2 %	3 %	4 %	5	6 %	7	8	9
Iron & Steel Foundries. 332	37.8	0.75	22.5	2.5 2.0	II	3.7	—	II	II
Office Supplies. 395	33.8	—	37.2	1.7 0.8	II	4.5	—	IV	III
Plastic Products. 3079	27.3	0.1	35.2	0.9 0.8	I	6.6	—	I	II
Metal-Working Machinery. 3548	36.0	0.1	27.8	0.5 0.5	I	6.0	—	I	I
Electrical Controls. 3622	28.4	0.2	37.3	1.0 0.5	I	4.9	—	—	II
Scientific Instruments. 381	42.9	—	38.6	0.7 0.7	I	4.5	—	—	III
Optical Instruments & Photographic Supplies. 383, 386	44.6	0.2	32.4	1.3 0.6	I	6.7	V	—	III
Medical & Dental Instruments. 384	23.8	0.1	38.0	1.5 0.5	II	5.4	—	II	III
Printing & Publishing. 27	33.0	—	30.0	1.3 0.8	II	3.1	—	II	II
Electrical & Electronic Tubes. 367	46.2	—	27.7	1.0 1.0	I	4.2	—	—	II
Machine Tools. 354	28.9	0.1	38.6	1.1 0.7	I	6.0	—	—	II
Cutlery. 3421	42.6	0.1	26.8	0.8 0.7	I	7.1	—	I	VI
Hand Tools. 3423	32.4	0.1	36.0	1.3 1.0	I	5.6	—	—	VI
Metal Coating & Engraving. 347	42.0	0.1	19.0	0.6 0.6	I	8.4	—	II	II

Specific Industrial Growth Prospects

The conclusions of the authors on industrial growth prospects of existing Chicago industries are summarized in column 9 of Table V. These conclusions are expanded in the specific industrial discussions that follow—discussions which also consider some industries not included in the Table. Conclusions about industrial growth prospects recorded in Table V and in the individual discussions were based upon answers to the following questions:

1) Is the industry sensitive to transportation-cost changes such as those expected to follow from Seaway and Waterway improvement?

2) What has been the recent employment trend of the larger industry group to which this activity belongs, and what are the group's prospects for "normal" growth (without reference to improvement of water transportation)?

3) Will Seaway and/or Waterway improvement permit more economical or more feasible accumulation of materials in the Chicago Area than formerly?

4) Will Seaway and/or Waterway improvement permit more economical or practicable access to markets?

5) Is there, on the basis of total population, an expansion potential for this industry within the Metropolitan Area or the Freight Rate and Shipping Advantage area?

6) Will Seaway and/or Waterway improvement seriously increase competition by foreign manufacturers in the Chicago market?

The answers to these questions for each individual industry are in part subjective and based upon evaluations by the authors of the evidence at hand. Some of the information basic to the answers is expanded in Volume II of this study (which contains an analysis of the competitive position of the Chicago Area in regional and world material and market patterns); other data are summarized in the individual columns of Table V, while additional supporting details are contained in the industry discussions to follow.

There are certain limitations in the scope of those discussions that should be noted. First, adequate data were not available to analyze Waterway-associated area industries —such as Primary Glass Products. Second, for some Chicago Area industries—notably Confectionery and Related Products — essential information was lacking.

It should be understood that few, if any, industrial types not now within the Area will develop here solely because of the water transportation improvements promised by the Seaway or Illinois Waterway. The great diversity and superlative development of present industrial activity preclude any striking new activities due alone to the changed competitive position of water transportation. However, certain types—not now well developed—may grow further, particularly as service industries to more important Chicago industries which have hitherto been dependent upon raw or semi-finished materials brought into the Area from foreign or coastal suppliers.

In the individual industrial expansion potential discussions that follow, detailed arguments are given for industries which the authors conclude will be most affected by improved water transportation (Growth Prospect Groups I, IV, and VI). More general summary statements are made about industries on which little or no waterway impact will be felt. The authors, with the reader, recognize that literally hundreds of industrial types neither can be nor are discussed individually.

GROWTH PROSPECT GROUP I

Industries in which a *trend to growth may be accelerated* by improved water transportation

Industry Type and Standard Industrial Classification Number[1]	Industry Group	Industrial Cost Pattern
Paperboard Boxes and Containers	265	Paper and Allied Products	4
Rubber and Rubber Products	30	Rubber and Misc. Plastics	1
Structural and Heat-Resistant Clay Products	325	Stone, Clay, and Glass Products	2
Abrasives	3291	Stone, Clay, and Glass Products	4
Asbestos	3292	Stone, Clay, and Glass Products	4
Treated Minerals and Earths	3295	Stone, Clay, and Glass Products	2
Inorganic Chemicals	281	Chemicals and Allied Products	4
Organic Chemicals (including Petrochemicals)	281	Chemicals and Allied Products	4
Papar and Paperboard	262, 263	Paper and Allied Products	4
Fertilizer	2871	Chemicals and Allied Products	4
Non-ferrous Metal Rolling and Drawing	335	Primary Metal Industries	4
Vegetable Oils	2091, 2092, 2093	Food and Kindred Products	5
Construction, Mining, and Oil Machinery	353	Machinery, except Electrical	6
Metal Stampings	346	Fabricated Metal Products	6
Iron and Steel Forging	3391	Primary Metal Industries	6
Non-ferrous Metal Foundries	336	Primary Metal Industries	6
Metal-working Machinery	3548	Machinery, except Electrical	7
Ferro-alloys	3313	Primary Metal Industries	X[2]
Food Processing Industries	206, 207, 2099	Food and Kindred Products	X
Ship Repairing	3731	Transportation Equipment	X
Secondary Smelting and Refining of Non-ferrous Metals	334	Primary Metal Industries	X

[1]The number following each industry name represents the placement of that industry in the Standard Industrial Classification.

[2]X designates those industries for which insufficient information was available to assign them to specific cost patterns.

The industries in this Group are already well developed in the Chicago Area, and their growth prospects seem good as a result of the normal growth and development anticipated for the whole economic complex. It seems likely, moreover, that their growth may be further stimulated by the improved water transportation made available by the expansion of the St. Lawrence Seaway and, eventually, of the Illinois Waterway. It is in many cases difficult to determine which improved water route will be more important, for raw materials to be processed by these industries may readily enter the Area from either the Seaway or the Inland Waterway system.

The industries in this Group are primarily those manufacturing producers goods—that is, their products will go primarily to other industries rather than to individual consumers. The establishments which form the market

for the products of the industries in this Group may be located either in the United States or overseas. It seems likely that increased export opportunities will account for at least a part of the stimulus to the growth of these industries expected from the improvement in water transportation.

While Chicago has a history of production in all of the industries in Group I (except petrochemicals), the relative importance of production here, even after the impact of improved water transportation, may vary considerably. In some cases, the Area's already great importance may be further increased as a result of the increased transportational advantage. In other cases, where Chicago has thus far had only a relatively small segment of the industry, the improved transportation routes, bringing increased possibilities for the import of raw materials or components and the export of products, may result in the development of a major center of production within the industry. On the other hand, the improved transportation may bring about only modest growth and leave the industry in Chicago still relatively less important than it is in other industrial centers.

This is to be expected because no single area can have a competitive advantage over other locations for all types of industry. Regional specialization in manufacturing reflects the impact of a variety of locational factors, and the improvement in only one cannot be expected in all cases to counteract the comparative disadvantage which may exist with respect to other locational factors.

Paperboard Boxes and Containers (265)[1]

This industry is one of those in which an increased growth is likely to be most directly and clearly related to improved water transportation. Both increasing markets and improved accessibility to raw materials for the industry may result.

One area of market increase may well be the growing volume of shipping on the waterways, and particularly the Seaway itself. As the export activities of Chicago manufacturers increase, as they must inevitably do, there will be an increasing market for boxes, cans, tubes, and drums made of fiber. There are already some 150 plants producing paperboard containers in the Chicago Area, and it seems likely that the anticipated increase in demand will be satisfied by expansion of existing production facilities.

Accessibility to the necessary raw materials at lower cost than formerly also seems likely to result from the improvement in water transportation. The industry is quite sensitive to transportation costs (Column 5, Table V), and any significant reduction in this cost category could result in a considerable advantage for production in the Chicago Area. Many of the products of this industry, although light in weight, occupy considerable space and therefore are normally not shipped any considerable distance before utilization.

There would seem to be some room for increased production of folded paperboard boxes for export. This possibility, however, seems likely to be more than counteracted by the increased competition expected by the trade from the import of these products. Competition from European producers, already on the increase, seems likely to be most serious.

One other sub-type of this industry appears to have excellent prospects for growth in Chicago, although this growth is probably not directly related to the improved water transportation. The manufacture of sanitary food containers should benefit from the increasing trend toward the packaging and sale of "convenience foods." Chicago's prospects for the growth of this branch of the food industry—particularly that part of it preparing either particular dishes or complete meals for freezing—seems good, and any growth in this activity in Chicago would necessitate a corresponding expansion of the food container industry.

This whole industrial group seems likely to benefit from the clearly established trend toward increased use of containers in all aspects of American life. Most familiar, perhaps, is the packaging of consumer items formerly sold unpackaged. The same tendency — to package industrial materials, particularly

[1]The number following each industry name represents the placement of that industry in the Standard Industrial Classification.

components for further manufacture—is equally clear and perhaps even more significant to the container industry. All branches of the paperboard container industry must benefit from increased ease of access to necessary raw materials in the Chicago Area as a result of the improved water transportation.

Rubber and Rubber Products (30)

The development of any branches of the rubber industry in the Chicago Area seems likely to be modest. The industry is one of those in which production here is most deficient in comparison with consumption (Column 7, Table V). It seems likely, nevertheless, that the expansion potential of the rubber industry in the Chicago Area lies mostly in smaller rubber products rather than in primary production of either natural or synthetic rubber; although a growing organic chemical industry may produce some specialized types of the latter.

Such products of the industry as industrial and mechanical rubber goods, rubberized fabrics, and vulcanized rubber clothing, as well as other rubber specialties and sundries, are already being manufactured in the Area. The industry is slightly sensitive to transportation costs and may well benefit from lower-cost accessibility of the raw material as a result of improved water transportation. It seems likely that the benefit from the possibility of more easily bringing synthetic rubber from the Gulf Coast area up the Waterway will be at least as important as the increased possibility of the import of crude natural rubber *via* the improved Seaway.

In the branches of the rubber industry which are represented and are likely to grow in Chicago, the tendency toward greater mechanization is extremely important. It seems likely, therefore, that the expansion of this industry in the Chicago Area may be greater when measured by investment in new plant or by value of output than when measured by increase in employment. The Rubber and Rubber Products industry seems to be one of those that is not likely to be adversely affected by the improved water transportation and may, in fact, benefit somewhat.

Structural and Heat-resistant Clay Products (325)

Only certain branches of this industry seem likely to expand as a result of the improvements in water transportation. In such items as brick and structural clay tile, ceramic wall and floor tile, clay sewer pipe, and other miscellaneous structural clay products, there is a very large deficiency in production in the Area, but problems of labor cost (Column 1, Table V) and space make it unlikely that these branches will expand materially beyond their present level. They may, however, enjoy some small growth as a result of market pressures growing out of increasing population. If this be the case, the possibility of more cheaply assembling their materials may help.

It is in the heat-resistant clay products branch of the industry, however, that the greatest potential for growth seems to exist. The very important steel industry of the Area provides a large market immediately at hand. While Table V is unable to distinguish between the particular industrial types making up this group, there has been a very large deficiency of production of refractory clay products in the Chicago Area. Recently a large new plant for the manufacture of basic refractories for the steel, foundry, metallurgical, cement, and glass industries has been erected here, and there seems room for considerable further growth.

The raw materials for the industry come either from overseas sources or from areas in the United States which can be reached by water transportation. Among the imported items, perhaps the most important is chrome ore from South Africa and the Philippines. Coastal and Seaway shipping could make more cheaply accessible dead-burned magnesite from Washington and from New Jersey as well as from a new plant in Ludington, Michigan.

The anticipated growth of the iron and steel industry in the Chicago Area is certain to increase the demand for heat-resistant clay products. The industry is transportation-sensitive and thus can most efficiently locate near its markets—if raw materials are cheaply available by water transportation. There is a discernible trend toward increasing use of

refractory materials, including those made from materials not previously used. With the increasing use of highly specialized refractories, it seems likely that such a major market area for the products of this industry as is found in Chicago will need to supply more of its requirements locally than has been possible in the past. This should mean a very considerable expansion of the structural and heat-resistant clay products industry.

Other Stone, Clay and Glass Industries (3291, 3292, 3295)

Several specific industrial types in this group which are already represented and showing prospects for growth in the Chicago Area seem likely to benefit materially by the improved water transportation now or soon to be available. All of these industries show Industrial Cost Patterns in which transportation, fuels and/or power, materials and/or water are important. The availability of all these requirements in the Chicago Area will be improved by the expanded possibilities for low-cost water transportation.

The *abrasives industry (3291)*, using both natural and synthetic materials, seems likely to gain by easier access to materials *via* the improved waterways. Products of this industry include buffing, polishing, cutting, and grinding wheels as well as abrasive sticks, paper, cloth, and loose grains. Both natural and synthetic materials for the manufacture of abrasives can be brought to Chicago by the improved waterways. The outstanding natural abrasive material, corundum, is produced only in South Africa and can be brought to the Chicago Area *via* the improved St. Lawrence Seaway. Probably the most commonly used synthetic abrasive, fused alumina or aluminum oxide, can be brought from the alumina plants of the Gulf Coast or Mississippi Valley by the improved Illinois Waterway.

Many of the products of the abrasives industry are highly specialized, and the manufacturers find considerable advantage in being located nearly adjacent to the major consumers of their product. With the industrial development of the Chicago Area, and with the high degree of specialization in metals found there, this is a nearly ideal location for abrasives manufacture. In the past this industry (although it cannot be distinguished in Columns 7 or 8 of Table V) has been greatly underdeveloped in the whole Chicago Transportation Advantage Area. With improved transportation services available, and with a consequent improvement in raw material supplies, the Chicago Area seems to have all of the essential requirements for an expansion of abrasives production.

The *asbestos products (3292)* industry is another transportation-sensitive activity, the growth prospects of which should be improved by the completion of the St. Lawrence Seaway project. The raw material for the industry is almost entirely imported, and the principal source of supply lies just to the south of the lower St. Lawrence River. It is thus readily available *via* the improved Seaway for manufacturing activities in the Chicago Area. Since the major consumers of asbestos products are industrial rather than individual, a major and diversified industrial concentration like Chicago offers a prime market for asbestos products.

The major products of the asbestos industry already being manufactured in Chicago are packing and pipe covering, insulating materials, and gaskets. These are all products which require relatively low-grade asbestos in rather large quantities, and therefore they are the type most likely to be aided by lower-cost water transportation. Other asbestos products including asbestos textiles and building material are also manufactured here. Since the United States is likely to continue to depend almost entirely on imports of asbestos, since the major source of imported asbestos lies adjacent to the St. Lawrence River, and since the Chicago industrial Area offers a major market for asbestos products, the expansion of this industry in the Area seems extremely likely in the future.

One of the miscellaneous mineral products industries which may undergo some expansion in the Chicago Area is the production of *treated minerals and earths (3295)*. This is a relatively small industry, but it has available here a large supply of an important raw material. The industry in Chicago is particularly

concerned with the crushing, grinding, and treatment of purchased slag from the steel mills. If export markets become available, there may well be some modest expansion of this industry in Chicago.

An industry whose prospects may change as a result of the improved Seaway, but for which the direction of change is difficult to determine, is the manufacture of *hydraulic cement (324)*. It has been placed in Group III, among those we believe will be stable in the Area; but, since certain opportunities exist that might lead to expansion, a brief discussion of the industry is included at this point. There is a huge market for cement in connection with the capital expenditures both of industry and of other types of activities in the Chicago Area. In addition, one of the major ingredients for the industry, blast furnace slag, is readily available here. Limestone can easily be brought in *via* Lakes transportation. Fuel and power and large supplies of water, important requirements for the industry, are readily available; yet, with all these advantages, cement is still a relatively underdeveloped industry in the Chicago Area. Further, it seems likely that the improved Seaway may harm rather than help the development of further cement manufacture in the Chicago region. Increasing import competition from low-cost European producers may be expected as a result of the larger ships now able to ply the improved Seaway. Only if large export markets can be found, and this at the moment seems unlikely, will the improved Seaway substantially aid the further development of the cement industry in the Chicago Area. After balancing the above considerations, it seemed that at best the immediate prospects for this industry might be for relative stability.

Inorganic Chemicals (281)

The inorganic chemical industry sells nearly all its products to other industries, either for process use or for further manufacture. This means that the inorganic chemical industry is best located in a major industrial center such as Chicago where its markets are concentrated. Even with this market advantage, however, such an industrial center is a good location for the chemical industries only if raw materials and other requirements are at hand or can be easily obtained. It is by making possible the more economical assembly of raw materials that the improved waterways will particularly aid the inorganic chemical industry of the Chicago Area.

Among the products of the inorganic chemical industry already being manufactured in Chicago are: sulphuric acid, alkalies, chlorine, inorganic paint pigments, medicinal grades of chemicals, inorganic acids, inorganic salts, fertilizer materials, and elemental substances for chemical use. The degree to which these branches of the industry are developed in Chicago varies considerably, as does their prospect for expansion as a result of improved water transportation.

One of the industries already well developed which is likely to benefit from the improvements in water transportation is the production of sulphuric acid. Here it is the improved Illinois Waterway which seems likely to be more significant, as it is along this route that sulphur from the Gulf Coast can most easily move. A large market and the other requirements for the industry are available in the Chicago Area, but the basic raw material must be obtainable in large quantities at low transportation rates if the industry is to grow.

Another industry, already represented in Chicago, which seems likely to benefit from cheaper water transportation is the production of inorganic paint pigments. The basic materials involved are lead oxide and titanium oxide and both of these may be brought cheaply and efficiently to Chicago *via* the improved Seaway. The well-developed paint manufacturing industry of the Chicago Area provides a ready market for pigments if they can be manufactured at competitive prices.

The branch of the inorganic chemical industry which produces alkalies and chlorine is not well developed at present in the Area. The production of soda ash, caustic soda, and chlorine may expand here in the future. Improved accessibility at low cost to raw materials by way of the deepened connecting channels forming part of the whole Seaway project may lower costs of production in Chi-

cago. Much of the industry is market-oriented, and Chicago — with large soap, paper, and petroleum-refining industries as well as other branches of the chemical industry—offers an excellent market for these heavy industrial chemicals. One problem which may delay the expansion of this branch of the inorganic chemical industry in the Chicago Area is the present excess national capacity for the production of these items noted by the trade.

The inorganic chemical industry is one of those insufficiently develped in the Area to serve the population of the area focusing on Chicago. This underdevelopment, however, is already being corrected. Investment in new facilities for the chemical industries has been particularly heavy in the Chicago Area in the past few years. This is one of the industries in which a tremendous investment may bring about only a very modest increase in employment. This is an industry, therefore, for which either rate of investment or value of output is probably a better measure of importance than the usual criterion of employment.

Organic Chemicals (281)

The organic chemical industry is one of the most rapidly growing activities in the Area at the present time, so any effect of water transportation would be accelerating rather than initiating. The organic chemical industry is also one of the most diverse to be found in the Chicago Area, and therefore this discussion can mention only a few of the more prominent branches of the industry. Even the rapid development of new facilities for the production of organic chemicals in Chicago has not brought the industry to a point where it can supply the needs of the area served by the City. This is still a deficiency industry in Chicago.

Developments in material supply, as well as continued growth of the huge local market, will play important roles in the anticipated expansion of this industry. The improved transportation available to this transportation-sensitive industry as the result of the waterway improvements will, therefore, be only one element in the improved opportunities for this group of industries in Chicago. The significance of improvements in this means of transportation is shown by the fact that a relatively large part of the industry's transportation expenditure has, even in the past, been paid to water carriers (Column 6, Table V).

One of the best developed branches of the industry in Chicago at the present time is the production of cyclic crudes from purchased coal tar. This is a means of using some of the by-products of the coking activities connected with the steel industry. In this branch of the industry, it is the increased possibility for export which gives promise for expansion in the future.

Probably the greatest advantage to be enjoyed by the organic chemical industry here as a result of improved water transportation is the cheaper and easier assembly of basic raw materials. The organic chemical industries are transportation-sensitive, and they use raw materials assembled from the four corners of the earth.

One of the most promising branches of the industry, as a result of improvement of water transportation facilities, is that whole segment which uses alcohol as a basic material and makes from it a host of products, including many of the best-known plastics. It is possible that the raw materials for alcohol manufacture may be accumulated *via* the water routes. It is more likely, however, that the alcohol will be brought in and further processed into other products. The advantages cited earlier for the sulphuric acid industry are of importance here as well, since increasing amounts of synthetic alcohol are being made with the use of sulphuric acid as a catalyst.

One of the few industrial types not now represented in Chicago's industrial diversity is the petrochemical industry. This is one of the most rapidly growing segments of the chemical industry, and it appears to have excellent developmental possibilities in the Chicago Area. The locational requirements of petrochemical plants are very similar to those of the petroleum refining industry, which has attained success in the Area. Petrochemical manufacture can take place at almost any location where natural gas, chlorine, sulphuric acid, and water are available in large quantities and where there is a market within eco-

nomical transportation distance. Water transportation for some of the products of the industry, while not indispensable, is an important additional attraction.

Petrochemical plants separate natural gasoline and oil from natural gas, and also produce compounds of hydrocarbons that can be made into organic acids and alcohols. Among the end products of this industry are ethylene, propane, butane, isobutane, synthetic ethyl alcohol, and ethyl chloride. Secondary processes result in the manufacture of such items as synthetic rubber and polyethylene, to name only two from a large number. All of these products, and especially synthetic rubber and polyethylene, have a huge market in the Chicago industrial complex. Export opportunities to Western Europe are excellent, and the improved Seaway will make possible direct shipment of the products of the petrochemical industry.

Much of the development in the expanding petrochemical field has taken place near the natural gas fields—as in the southwestern United States or in Alberta, Canada. But plants are also established adjacent to gas pipelines nearer to markets—for example at Tuscola, Illinois. It is often more economical to transport the raw material *via* pipeline than to carry the great variety of products made from the gas. It is possible to tap gas lines near markets because even after the useful chemical materials have been extracted the residue gas, reduced only a little in volume, is still effective as a fuel.

All the materials for the petrochemical industry are available in Chicago. Many gas pipelines converge on Chicago. The expanding chemical industry of the city is in a position to supply sulphuric acid and chlorine. There is an unsurpassed water supply available from both surface and ground water sources. Thus, the manufacture of petrochemicals seems to have excellent opportunities to move into the Chicago region. It might be possible to "wring" the chemicals out of natural gas prior to storage in the gas storage domes in the area.

The benefit that a petrochemical industry would derive from the Seaway or the Waterway would be indirect, except for its accumulation of sulphur *via* the Waterway and the shipment of products over the Seaway. However, growth attributable to improved water transportation of other segments of the chemical industry from which petrochemical plants purchase materials and to which they sell products would benefit a plant of this industry in the Chicago Area or at some point near gas pipelines along the Waterway.

The increasing practice of shipping chemical products in specially designed containers has made water transportation more attractive to the industry than it has been in the past. The Illinois Waterway already carries many specialized tank barges with special equipment to keep chemicals in satisfactory condition. It seems extremely likely that in the future ocean-going vessels will be similarly modified if there is a sufficient flow of material to warrant such special-purpose vessels. As more countries of the world industrialize, it seems likely that they will for some time provide good markets for the products of such sophisticated industries as those producing organic chemicals. It seems possible, therefore, that the improved Seaway may offer expanded export possibilities for the products of the organic chemical industry.

Paper and Paperboard (262), 263)

The paper industry is one which is already fairly well developed in the Chicago Area, but the development thus far has concentrated primarily on paper conversion rather than on the primary manufacture of paper. Only a very small proportion of the Area's needs for paper and paperboard are met by local production.

The industry is moderately sensitive to transportation costs, and water transportation charges make up a considerable proportion of the total transportation charges of the industry. This means that the improvement of both the Seaway and the Waterway offer improved opportunities for assembling the raw materials of the industry. It is unlikely, however, that the primary paper industry in Chicago will develop to the point of making significant use of the water routes for shipment of the products. It appears that, though some ex-

pansion may come, production will remain well below the demands of the Chicago Area itself.

The branch of the industry most likely to develop further in the Area is the manufacture of paper and paperboard from purchased pulp. The raw materials can be most efficiently converted to pulp near their point of origin, but the resulting pulp can be easily transported by water carriers to manufacturing establishments in Chicago or along the Illinois Waterway. The large import of pulp from Canada makes the improved St. Lawrence Seaway a potentially important route. The rapid development of pulp wood and pulp production in the southern United States makes the improved Illinois Waterway a potential route for supplies of pulp to Chicago and Waterway area paper plants.

It is often said that modern industry runs on paper, and it is unlikely that such a major industrial and commercial center as Chicago will continue to have such an underdeveloped supply of this important "material." A reduction in the cost of transporting the essential raw material, together with the development of special-purpose carriers of the material, should make the basic paper industry a sound economic prospect for Chicago in the future. The very large local demand for paper and paperboard for further manufacture by the well-developed paper-conversion industry will offer constant encouragement to the further development of primary paper and paperboard production.

Fertilizer (2871)

An important center of the chemical industry, located in the heart of a rich farming area, would seem to be a natural center for the production of fertilizers. Chicago, located in such a situation, does indeed produce significant quantities of fertilizer, but the industry is less developed than one might expect from the situation of the city. The growth prospects for the industry, however, seem excellent, both in the Chicago Area and in the area served by the Illinois Waterway.

The market area for fertilizer manufactured in this region is well developed and fairly concentrated. From Chicago fertilizer can be sent to a distance of several hundred miles in all directions either by truck or rail. The economies of scale offer considerable advantage to the manufacture of fertilizer in large quantities in a central location with subsequent distribution to areas of use.

All of the essential raw materials for fertilizer manufacture are either now made in Chicago in considerable quantities or can be easily assembled there by economical means of transportation. It is in the cheaper assembly of the basic raw materials that the improved water transportation now available to the Chicago Area seems likely to exert its influence. This industry is among the most sensitive to transportation costs of all of those now operating in Chicago. Anhydrous ammonia and other forms of nitrogen are already manufactured in large quantities by the chemical industry of the Chicago Area. An earlier section of this discussion pointed out the increased advantages in Chicago for the manufacture of sulphuric acid. This acid is the major processing chemical needed in large quantities by the fertilizer industry.

The two other important components of prepared fertilizers are phosphate and potash. All of the phosphate used in the fertilizer industry of the United States is produced within this country. The most important source area is central Florida, and phosphate from this region can now be cheaply transported to Chicago either by coastwise shipping using the improved St. Lawrence Seaway or by barge transportation up the Mississippi River and the Illinois Waterway. Potash supplies for the fertilizer industry come either from southwestern United States or are imported from France and Germany. In the case of potash from southwestern United States, Chicago is in an advantageous position to receive the material by rail. Imported potash can, with the improvement of the Seaway, now be cheaply brought directly to Chicago from its point of origin.

Both the fertilizer industry, as such, and plants making components for mixed fertilizers can be expected to expand in the Chicago Area. Such products as phosphoric acid, muriate and sulphate of potash, as well as am-

monia compounds and anhydrous ammonia, can efficiently be made here for shipment to fertilizer mixing plants located in consuming regions.

Non-ferrous Metal Rolling and Drawing (335)

This industry produces such basic shapes as plate, sheet, strip, bar, and tubing from any of the non-ferrous metals by rolling, drawing, or extruding the metal. The industry is already represented in the Chicago Area by firms processing copper and copper-base alloys, aluminum and aluminum base alloys, as well as other industrial alloys including monel metal, white metal, antifriction metal, babbit metal, type metal, and solder. The industry has grown rapidly in the Chicago Area in the years since World War II, but the output is still insufficient to meet the demands of the Area. This is one of the industries in which production is deficient for regional supply.

Primary non-ferrous metal production is not now of major consequence in the Chicago Area nor is it likely to be so in the future. However, changes taking place elsewhere in the primary production of non-ferrous metals, combined with the improvement of water transportation to Chicago, seem to offer considerable opportunity for still further expansion of the rolling, drawing, and extruding branches of the non-ferrous metal industries here. At least a significant part of the United States supply of each of the non-ferrous metals is imported. In the past the practice has been to import the metal in some unrefined state and do the refining in the United States. More recently, however, refineries are being set up near the areas of initial production—places as far removed as Peru and the Belgian Congo.

When the refined metal in ingot or bar form is brought to the United States, the tendency is to carry it as near the market as possible before processing it into products for sale. With the striking development in Chicago of the fabricated metal industries and both electrical and non-electrical machinery, this city constitutes one of the major markets for the basic shapes made from non-ferrous metal. Shipments of material for this industry, particularly brass and bronze and aluminum, are already coming in over the Seaway. There is good reason to expect that the volume of these shipments will increase significantly in the future. This is, however, an activity in which growth may be markedly affected by factors beyond the direct control of anyone in the Chicago Area. There is, and has been for some time, a considerable controversy concerning the tariff rates on imports of non-ferrous metals. As long as the tariffs are held down to reasonable levels, the Chicago Area may anticipate a considerable expansion of the non-ferrous rolling, drawing, and extruding industries.

Vegetable Oils (2091, 2092, 2093)

This industry includes plants which process purchased vegetable oils as well as the primary mills engaged in manufacturing oil and by-product cake and meal directly from the raw materials. The most important items processed into oil are corn, soybeans, and cottonseed.

The vegetable oil industry in the Chicago Area should expand both because of increased advantages to its own operations resulting from improved water transportation and because it is likely to find larger local markets in other industries favored by the new transportation developments. A tremendous variety and a considerable quantity of vegetable oils are used as raw materials for further processing, particularly by certain branches of the chemical industry. The anticipated growth of the chemical industry has already been discussed, and as this market in the chemical industry expands the growth of vegetable oil production seems likely.

The assembly of raw materials for processing by the vegetable oil industry will be much facilitated by the improvements in water transportation. It will be possible to assemble more cheaply both corn and soybeans from a considerable area of the central United States *via* the improved Waterway. Either cottonseed in bulk or crude cottonseed oil can also be brought *via* the inland waterway system to Chicago. There is some demand for the processing of imported oil-bearing seed and nut

materials, and these can now be brought more cheaply to Chicago *via* the improved St. Lawrence Seaway.

There seems to be a definite tendency toward the replacement of animal fats and oils by vegetable oils in the diets of people in many areas of the world. Chicago, which used to be a world center of animal fat production, may find it now has sufficient advantages to become a major center of vegetable oil production. As the standards of living are raised in countries throughout the world, there is likely to be an increasing demand for the products of this industry. Export over the improved Seaway offers further opportunity for expansion of this industry in the Chicago Area.

Construction, Mining, and Oil Machinery (353)

This is an industry whose basic function is the assembly of components from a great variety of other industries and their combination into highly specialized machinery for particular purposes. It is an industry which can be carried on successfully only in a major industrial center located in a highly industrialized nation. This, of course, is an excellent description of Chicago, and the industry is already well developed here.

Many of the products of this industry are either constructed on a custom basis to meet the problems of a particular job or are of advanced design available only here and nowhere else in the world. The machines produced by this industry thus find a world-wide market. In fact, more than one-third of the output of this industry is exported.

There will probably be relatively little effect upon the domestic segment of this industry, because the industry is not sensitive to transportation costs. However, the construction of these specialized machines for export should be greatly encouraged by the possibility of direct economical shipment to overseas destinations. Freight rates on heavy construction and road-building machinery are exactly the same to western European destinations from Chicago as from Atlantic ports; thus, direct shipments save overland charges from Chicago to the East coast.

The export market for these machines—which in a very real sense is actually the exportation of American ingenuity and technological progress—seems likely to remain good in the future. It is encouraging to note that some of the necessary steps are being taken to protect Chicago's position in these lucrative export markets. An example of this is the provision of the new barge-mounted crane of 110 tons capacity which is particularly useful for loading heavy machinery into ships. As long as care is taken to keep the products of this industry made in Chicago abreast of technical changes, the already fast-growing industry should further expand here as a result of the stimulus of the improved Seaway.

Metal Stampings (346)

This industry manfactures metal stampings by the use of tools, dies, jigs and fixtures to punch, draw, form, or otherwise modify materials under pressure in a machine. It is an industry which is already well developed in the Chicago Area. As a result of past development, there are more than 200 plants in the Area engaged in this kind of manufacturing, and the industry has recently been augmented by the opening of the huge new Ford Motor Company stamping plant in Chicago Heights.

The products of this industry are sold primarily to other manufacturers. Elaborate and costly machinery as well as great care and precision are required. The economies of scale involved make volume production desirable.

The basic market for the products of the metal stampings industry must continue to be the other industries in the Chicago Area. A marginal market of some importance, however, may be found in overseas areas having a demand for particular products of the industry but a demand too small to justify the establishment of a complete producing unit. It is in the improved possibility of shipping the products of the industry to these overseas markets that the Seaway will have its impact. Both unique products, made nowhere else, and those most efficiently made in very large

quantities should find a satisfactory export market if sales efforts are aggressive.

Iron and Steel Forging (3391)

The economies of scale tend to concentrate the iron and steel forging industry near a major source of materials. With the unexcelled development of the basic iron and steel industry in the Chicago Area, this becomes an ideal location for iron and steel forging. Both in plants directly connected with the steel mills and in separate establishments, the industry is already well developed in the Chicago Area.

This industry is another which may expect to find export markets because of the economies involved in efficient large-scale production here and because the demand for specific items in many other localities is not great enough to warrant the establishment of a unit of this industry of economic size. With aggressive exploitation of export possibilities, the Seaway should provide a distinct acceleration to the rate of growth of this industry in the Chicago Area.

Non-ferrous Metal Foundries (336)

The non-ferrous metal foundry industry is tied very closely to its markets. Its activity consists primarily of making castings which are parts of the products of other manufacturers. The market, then, is almost wholly industrial. The castings are specialized to the degree that close coordination between the producer and user of the castings is vitally important. This means that an industrial center as highly specialized in metals and machinery production as the Chicago Area constitutes the logical location for the non-ferrous metal foundry industry.

A major impact of the improved water transportation available in the Chicago Area will be in the lower cost of assembly of the materials for this industry. The refined metal is brought in as ingots or bars from the refineries, an increasing number of which are located overseas in the area of primary metal production. Some of the aluminum to be used may come up the improved Illinois Waterway from Gulf Coast or Ohio River refineries. The growth of the non-ferrous metal foundry industry in the Chicago Area will depend primarily upon an expansion of the demand for its products in the other industries of the Area. The improved low-cost water transportation will enable this demand to be met locally at competitive costs. There is also the possibility of some marginal increase, particularly over the Seaway, in the exports of this industry.

Metalworking Machinery (3548)

This industry is already well developed and prosperous in the Chicago Area. More than 200 plants are already making the highly specialized products of this industry. The list of machines which are manufactured by this industry is very long, but among the more important are such things as rolling mill machinery, power-driven hand tools, welding equipment, wire fabricating machinery, automotive maintenance machinery, power shears, tin can forming and soldering machines, and foundry and forging mill machines.

This industry, like others already discussed, draws heavily upon other manufacturers for components, giving significant advantages to production in an area where industry is as diversified as that of Chicago. This same highly diversified industry, of course, provides the primary market for the products of the metalworking machinery industry. Retail sales of these items are of minor importance.

Many of the machines manufactured by this industry are made by only one establishment in the whole world. This unique quality of many of its products opens considerable export markets to the metalworking machinery industry, and with the rise of industrialization in many areas of the world this market seems likely to increase rather than diminish. The possibility of shipping these heavy, bulky, but valuable machines *via* the improved Seaway directly to overseas destinations gives the industry in the Chicago Area a marked advantage. This industry seems certain to grow as a result of the normal industrial development of the Area, but it seems likely that increased shipping possibilities as a

result of the improvement of the St. Lawrence Seaway may accelerate the rate of growth which would otherwise be experienced.

Ferro-alloys (3313)

The production of ferro-alloys seems likely to increase significantly in the Chicago Area as the result of cheaper access to alloying materials *via* the improved Seaway. The Seaway is particularly important because many of the alloying elements must be imported into the United States and these can now come directly to Chicago without trans-shipment. The United States relies almost wholly upon imports for the supply of the three alloying elements used in greatest quantity—manganese, chromium, and nickel. Other elements imported include tungsten, cobalt, columbium, and zirconium.

Ferro-alloys are made in two types of establishments in the Chicago Area, and both will probably find new advantages as a result of improved water transportation. Large quantities of alloys made on a production-line basis are produced by the large iron and steel mills of the Area. Smaller quantities of more specialized products are made by smaller manufacturers, often using electro-smelting processes.

Alloy steels manufactured in the Chicago Area already find a wide market in the United States. With the possibility of more cheaply assembling the imported alloying elements, Chicago will have advantages for this branch of the industry unmatched except at the relatively few other coastal and Seaway-sited plants.

Food Processing Industries (206, 2072, 2099)

The food processing industries as a group have long been important in Chicago. The products of the group are so diverse, and the locational requirements of the various segments of the industry differ so widely, that one cannot expect the impact of such developments as the improved Seaway and Waterway to affect all segments of the industry to the same degree or in the same direction. Some branches of the food processing industries have been included in other Growth Prospect Groups. Some may have their decline arrested by the improvement in water transportation, some may grow without reference to the improved water transportation, while at least one has already been dealt with in this section as a likely possibility to have its growth accelerated by the Seaway and Waterway improvements.

Included within the food processing industries are three types which may be regarded as "long shots" for accelerated growth as a result of the improved water transportation. One of these is *sugar refining (206)*. This industry is little represented in the city at the present time, since most of the cane sugar refineries of the country are located on coastal sites. The improvement of the Seaway makes Chicago a coastal site, and it is conceivable that raw sugar can now be brought to Chicago at low rates directly by ship from the areas of production. However, Chicago at the present time enjoys certain advantages in the sugar market. It is what has been called a "sugar battleground." Sugar from all the refining areas of the country can reach this region, and the influx often means that sugar is obtainable here at relatively low prices. As long as this situation prevails, it is unlikely that a major development of sugar refining will take place in Chicago. Should the marketing structure of the industry change in the future, however, sugar refining may undergo a significant development in the Chicago Area.

Another possibility for the indefinite future is the expanded development of *coffee roasting and grinding (2099)* in the Chicago Area. This industry, too, is already represented here, but it is not developed to the extent one might expect from Chicago's position as a supplier to much of Mid-America. The feasibility of bringing coffee direct to Chicago *via* the Seaway has already been demonstrated. In the first season of operation of the expanded Seaway, coffee was brought to Chicago directly from Colombia by ocean vessel. The drawback to expansion of the coffee roasting and grinding industry in Chicago lies not in any disadvantage in the Area but rather in the productive structure of the industry na-

tionally. According to the analysis of those in the trade, there is more than adequate coffee roasting and grinding capacity already in being in the United States. If the market for coffee expands, or if some of the plants now in production become classed as obsolete, some of the new capacity may well be installed in the Chicago Area. Trends in the industry towards centralization and operation in very large units favor Chicago's chances for new units of this industry in the future.

A rather similar situation to that prevailing in the coffee industry also characterizes the *roasting of cacao* and the manufacture of *chocolate and chocolate products (2072).* This is another industry which is already present in Chicago, but the development here does not seem commensurate with Chicago's importance as a national center of the confectionery industry. With the additional advantages offered by the possibility of direct import of cacao beans *via* the Seaway, it seems likely that at some time in the future the cacao roasting and chocolate production branches of the food processing industry may expand in Chicago.

Ship Repairing (3731)

With an increased traffic of ocean-going and lake vessels as well as of Waterway tows, there seems to be the possibility of a modest expansion of ship repairing activities in the Chicago Area. It is likely that these activities will be largely confined to ship repair rather than ship construction, and the industry will probably attain no more than moderate size. Any area in the United States has two basic disadvantages for either shipbuilding or, to a lesser degree, for ship repairing. In the first place, it has recently been estimated that the cost of shipbuilding in the United States is approximately double the cost elsewhere in the world. This primarily reflects the high American wage rates and these are also a major handicap for ship repairing. Secondly, many of the ocean-going vessels, particularly, which call at Chicago are foreign-owned ships, and their owners will usually choose to have only the most urgent repairs done away from the home ports. An additional handicap to the industry in the Chicago Area is the relative lack of waterfront space. Ship repairing is an activity which requires considerable room, and the Chicago Area can probably put most of its available waterfront space to more intensive and, therefore, more profitable uses. Nevertheless, the amount of ship repair necessary at Chicago will increase proportionally with the increase in traffic, and therefore the ship repairing industry seems to have some potential for expansion at this time.

Secondary Smelting and Refining of Non-ferrous Metals (334)

The secondary production of non-ferrous metals is already actively being carried out in the Chicago Area. Nevertheless, at present the demands for these products locally are greater than the industry can supply at its current stage of development. The principal limiting factor on the industry in the past has been the availability of scrap—the primary "raw" material for this industry.

The improved Seaway may well make available larger scrap supplies at economically competitive prices. Both United States coastal and foreign sources of scrap now become more accessible to the secondary non-ferrous producers in Chicago. Both the large unserved market available locally and the prospects for growth in other branches of the non-ferrous metals industry (noted elsewhere in this section) make the secondary smelting and refining of these metals a good growth prospect for the Chicago Area.

GROWTH PROSPECT GROUP II

Industries which may *grow without reference* to improved water transportation

Industry Type and Standard Industrial Classification Number	Industry Group	Industrial Cost Pattern
Automotive Equipment and Parts.....3714	Transportation Equipment	1
Metal Furniture 3514, 3522	Furniture and Fixtures	1
Millwork 2431	Lumber and Wood Products	1
Fabricated Wood Products 249	Lumber and Wood Products	1
Wood Partitions, Shelving, and Other Office and Store Fixtures.....2541	Furniture and Fixtures	1
Beverages 2086	Food and Kindred Products	1
Fabricated Structural Metal Products 344	Fabricated Metal Products	1
Plastic Materials 2821	Chemicals and Allied Products	1
Electrical Equipment for Engines.....3694	Electrical Machinery, Equipment, and Supplies	1
Gypsum and Concrete Products 327	Stone, Clay, and Glass Products	2
Electrical Appliances 363	Electrical Machinery, Equipment and Supplies	3
Blast Furnaces, Steel and Rolling Mills 331	Primary Metal Industries	4
Drugs and Medicines 283	Chemicals and Allied Products	4
Petroleum Refining 291	Petroleum Refining and Related Industries	4
Canning and Freezing of Foods.....203	Food and Kindred Products	5
Tin Cans 341	Fabricated Metal Products	5
Radio and Television 3651	Electrical Machinery, Equipment, and Supplies	6
Telephone and Communication Equipment 366	Electrical Machinery, Equipment, and Supplies	6
Pumps and Compressors 3561	Machinery, except Electrical	6
Electrical and Other Industrial Machinery 362	Electrical Machinery, Equipment, and Supplies	6
Refrigeration Equipment 3585	Machinery, except Electrical	6
Heating Equipment 3433	Fabricated Metal Products	6
Toys and Sporting Goods.....394	Miscellaneous Manufacturing Industries	6
Plumbing Supplies 3431, 3432	Fabricated Metal Products	6

GROWTH PROSPECT GROUP II (Con't)

Industry Type and Standard Industrial Classification Number	Industry Group	Industrial Cost Pattern
Bakeries	Food and Kindred Products	6
Iron and Steel Founderies	Primary Metal Industries	7
Plastic Products	Rubber and Miscellaneous Plastic Products	7
Electrical Controls	Electrical Machinery, Equipment, and Supplies	7
Printing and Publishing	Printing, Publishing, and Allied Industries	7
Electrical and Electronic Tubes	Electrical Machinery, Equipment, and Supplies	7
Machine Tools	Machinery, except Electrical	7
Metal Coating and Engraving	Fabricated Metal Products	7

Chicago is a great and prosperous industrial center. It was prospering before the improvements of the Seaway and Waterway were even projected, and industrial growth is the natural order of things in Chicago. It is, therefore, to be expected that a continuation of this growth in diverse fields would place the largest number of industries in the category of those which will grow without reference to improved water transportation.

The industries which are growing in Chicago exemplify well the industrial structure discussed in Section II. The largest number of industrial types in this Growth Prospect Group, 19 out of the 32, are included in four major groups of greatest importance in Chicago—the Metals (primary and fabricated) and Machinery (electrical and non-electrical) groups. Chicago's industrial diversity is also illustrated by the fact that at least seven other major industrial groups are represented by types which are expected to grow.

The importance of certain industrial cost patterns to Chicago is also shown by the industries in this Growth Group. More than three-quarters of all the industries included here in Group II fall in industrial cost patterns 1, 6, and 7. In all of these industrial cost groups, labor is a common element. This illustrates again the tremendous advantage accruing to Chicago from its highly skilled and hardworking labor force. For certain industries, low-priced labor is essential; but for most of the more complex industrial types the productivity of labor in Chicago, combined with the other advantages of the Area, more than compensates for any labor price differential and makes labor costs in Chicago a favorable aspect of its industrial cost pattern.

The industries contained in this Group include many of those long established in Chicago and in which Chicago has a world-wide or at least national reputation. The growth of these industries is indisputable; it is only the direct Seaway connection which is not to us apparent. In the case of such prominent activities as the primary iron and steel industry and petroleum refining, other areas may benefit somewhat more directly from the improved Seaway. Chicago's advantages in these activities are so great, however, that further growth here is inevitable. It must be remembered, of course, that in these industries, as in all the others for which growth or stability is predicted, the general relative lowering of all transportation rates which will result from more effective competition by water carriers must further improve Chicago's position.

As a final note, one should call attention to the predominance of producers goods in this group of growth industries. This reflects the increasing concentration of Chicago industry

GROWTH PROSPECT GROUP III

Industries which may remain *stable* in Area

Industry Type and Standard Industrial Classification Number	Industry Group	Industrial Cost Pattern
Agricultural Machinery and Tractors	352	Machinery, except Electrical	1
Boiler Shop Products	3443	Fabricated Metal Products	1
Locomotives	3741	Transportation Equipment	1
Railroad Cars	3442	Transportation Equipment	1
Cement	324	Stone, Clay and Glass Products	2
Glass Products from Purchased Glass	323	Stone, Clay and Glass Products	2
Soaps and Cleansers	284	Chemicals and Allied Products	5
Grain Milling	204	Food and Kindred Products	5
Paints, Varnishes, Lacquers	285	Chemicals and Allied Products	5
Engines and Turbines	351	Machinery, except Electrical	6
Elevators and Conveyors	3534, 3535	Machinery, except Electrical	6
Watches and Clocks	387	Instruments	6
Commercial Machinery and Equipment	357	Machinery, except Electrical	6
Office Supplies	395	Miscellaneous Manufacturing Industries	7
Scientific Instruments	381	Instruments	7
Medical and Dental Instruments	384	Instruments	7
Optical Instruments and Photographic Supplies	383, 386	Instruments	7
Primary Glass Products	321	Stone, Clay, and Glass Products	X
Confectionery	207	Food and Kindred Products	X

on the manufacture of producers goods, and it reflects also the tremendous industrial market offered by the diverse manufacturing establishments of Chicago. The consumers goods industrial types included in this Group reflect primarily the market offered by the huge population concentration in the Chicago Area.

In such a dynamic industrial structure as exists in the United States, and particularly in Chicago, stability or lack of change is perhaps the least likely condition to be predicted for any industry. When stability is anticipated, it is usually a stability resulting from a balance of forces rather than from the lack of any tendencies to change. With regard to the industries placed here in this Group, it is such a balance of forces that leads us to anticipate an over-all condition of relative stability.

Some of the forces which may be expected to operate on the industries in this Group would lead one to anticipate decreased activity in these industries. Many of the executives of these industries now established in the Chicago Area are aware of the adverse forces and are taking steps to cope with them. In other cases certain forces might be expected to lead to greater activities in these industries in the future than in the past.

There are two factors in particular which seem likely to affect adversely the industries in this Group in the Chicago Area. In many of these industries, there is a national trend toward location outside of major metropolitan areas within the Manufacturing Belt. In most cases, this trend is no more pronounced in Chicago than in other similar mature manufacturing centers. The second adverse influence is likely to come from increasingly severe foreign competition in United States markets. This again will affect all of the major industrial areas in the United States, although it may be felt somewhat more in Chicago than in some other areas because of the availability of the improved Seaway.

While the adverse factors affecting the industries in this Group were common to all or most of the major manufacturing areas of the country, the factors encouraging a belief in the continued prosperity of these industries are essentially specific to Chicago. Perhaps the most important favorable factor is the very large and steadily growing market which can best be served by manufacturers in Chicago. This favorable position with respect to a large and growing market reflects, of course, Chicago's transportational centrality and its economic dominance in the American Midwest. Another favorable influence will be the forces of industrial inertia. In most of the industries in this Group, Chicago has in being major productive facilities which could be reproduced elsewhere only at tremendous cost. In addition, Chicago has built up over many years the ancillary industries and services necessary for the proper functioning of the basic producers.

These adverse and favorable forces will operate in different combinations upon the different industries in this Group. On balance, however, we feel that the net result of the impact of these divergent forces will be a level of activity in these industries in Chicago roughly comparable to that of the present.

GROWTH PROSPECT GROUP IV

Industries in which a trend to *decline may be arrested* by improved water transportation

Industry Type and Standard Industrial Classification Number	Industry Group	Industrial Cost Pattern
Wood Containers 244	Lumber and Wood Products	1
Tanning and Finishing of Leather 311	Leather and Leather Products	1
Animal Fats and Oils 2094, 2095	Food and Kindred Products	3
Meat Packing 201	Food and Kindred Products	5
Special Industry Machinery 355	Machinery, except Electrical	6

As a result of the continual process of industrial change which affects Chicago as it does all major industrial areas, certain industries have been declining here. In most cases, this reflects changes either in raw material sources or in location of the market which have taken place as the result of broad national trends of resource use, industrial development, and population movement. For the industries included in this Group, it is thought that the improved water transportation available as a result of the improvement of the Seaway and the Waterway may reduce the impact of the factors which were causing the industries to decline in the Chicago Area. In general it has seemed (see Growth Prospect Group I) that the industries most likely to be benefited by the improved water transportation are those which produce items for sale to other industries rather than for direct consumer sale. All of the industries in Group IV except Meat Packing fall also in that category. Even some of the products of the Meat Packing industry, and certainly of the subsidiary Leather and Animal Oil industries, are sold for further processing. The industries in this Group, then, seem likely to find sufficient renewed advantages in Chicago as a result of improved water transportation to arrest their decline from their former positions of importance.

Wood Containers (244)

This industry type includes producers of wooden crates, cases, drums, barrels, all used primarily for protection of other goods during storage and shipment. Much that was said above about Paperboard Boxes and Containers (included in Growth Prospect Group I) applies to the Wood Containers industry. Developments in heavy packaging made from paper and other fibers, and high costs of wood, seriously have affected the use of wood containers over the years. We believe, however, that the more economical availability of low grade wood *via* Seaway from eastern Canada and from the South *via* the Waterway, plus an increased local market for stout shipping containers provided by the increased traffic over both Seaway and Waterway, may have a beneficial effect on the fabrication of wood containers. The industry is extremely sensitive to transportation costs, its payroll costs are moderate in relation to value of products, and wooden containers are in short supply in the Area.

Tanning and Finishing of Leather (311)

This industry developed in the Chicago Area largely because of the availability of its raw materials—particularly the hides from the

meat packing establishments. There has been, in fact, a surplus of hides and skins, and these have been exported from the Area. This surplus might become a deficiency with the sharp decline in meat packing, but both the "bottoming-out" that is predicted for slaughtering, and the greater availability of hides *via* the Seaway seems to preclude the possibility of this industry lacking for materials in Chicago.

Because it is highly sensitive to transportation cost changes, the lower relative costs of both material accumulation and product distribution that will result from improved water transportation should benefit the industry. Both materials and products are well suited to water transport.

Also, current and probable future expansions in the organic and inorganic chemical industries in the Chicago Area will make the necessary tanning and seasoning materials more easily and cheaply available. Requirements like gum and wood chemicals, particularly tan barks, which cannot be satisfied locally, can be imported by water more readily now than before the Seaway improvement.

Labor costs are relatively high in this industry, and the future of the industry will depend upon the balance of advantage between the increased economy of water transportation and high payroll costs which might tend to make the industry seek non-metropolitan sites.

Animal Fats and Oils (2094, 2095)

Edible animal fats (particularly lard) and inedible greases and tallow have long been important items of export from the United States, and these commodities have been exported from the Port of Chicago even before the improvement of the Seaway. These secondary products of the meat industry have been shipped from the United States in greatest quantity to Great Britain, Cuba, Yugoslavia, and West Germany. Even in 1957, it was about $13 per long ton cheaper to ship lard by all-water movement from Chicago to Liverpool, England, than to ship it by rail to New York and by ocean freighter beyond. The accessibility of products from Chicago to all of the overseas markets for animal fats has been made more economical as a result of the larger vessels which can be accommodated on the improved St. Lawrence Seaway.

Dependent as it is upon the meat packing industry for its materials, and using materials that are much more perishable than the items produced, the animal fats and oils industry is located at the source of its materials, and its success depends upon the fortunes of its source of supply. Therefore, the upturn foreseen for meat packing in Chicago will be reflected in the associated ancillary types. The most important of these associated types is animal fats and oils, but also included are industries using fat, bones, and meat scraps to produce bone meal for feed and fertilizers, fatty acids, and other products. The animal fats and oils industry will be particularly benefited if the actual slaughtering of animals continues to take place in Chicago, as has been widely predicted by stockyard interests.

The major impact of the improved water transportation on the animal fats and oils industry, then, will be primarily an indirect one. Although there may be some improvement in market accessibility afforded by the Seaway, the industry has low labor costs and low transportation-sensitivity so the major impact will come through the improvement in the prospects for meat packing. If this suggested sequence of benefits transpires, certain related industries, such as those producing cosmetics, facial creams, soaps, and some lubricants, may also benefit. All of the prospects of the animal fats and oils industry are limited, of course, by the trend toward greater use of vegetable fats and oils. This trend, however, is already well established and will probably do no more damage to the animal fats and oils industry in the Chicago Area.

Meat Packing (201)

Many considerations have been responsible for the massive withdrawal of major meat packers from the Chicago Area. Obsolesence of large-scale plant and equipment and the high cost of its replacement have contributed much to the decision to cease operations in this City. Very narrow margins of profit characterize the industry and savings in any cate-

gory of industrial cost are important, so the generally higher wages required for workers in all metropolitan areas also weighed in the final decision to abandon the largest plants. Narrow profit margins also make it of great importance that the relatively high costs of bringing live animals to the packing plant in prime condition be minimized, and that costs of distribution of perishable products be kept as low as possible.

The move from Chicago reflects also certain processing and marketing trends of the industry. Formerly, when the Chicago industry served much of the nation, the slaughter houses did not engage extensively in cutting and packaging or other processing of the carcass. Shipping costs on carcasses were not disproportionately higher than on live animals, which posed special shipping problems to railroads or truckers. However, a trend in wholesale marketing toward producing meats which are cut, packaged, and otherwise completely ready for retail sale has resulted in a tendency toward market orientation of the packing plants. Transportation costs are higher on more fully prepared meat products than on the carcass, and rather distinct regional differences in preference for kinds of cuts and methods of preparation has further emphasized the economies of decentralization. At the same time, cattle fattening as a type of agriculture has spread, and animals, therefore, have become readily available to widely dispersed packing plants.

An even more recent development—that of freezing retail cuts, or cooking, packaging, and freezing meats alone or as parts of complete dinners—has increased the market sensitivity of segments of the industry. This is largely because the transportation of frozen foods poses special problems which result in high costs.

The very trends which have resulted in the abandonment of obsolete facilities in the Chicago Area are likely to result in a rejuvenation of certain branches of the industry in this Area. Tradition, "know-how," established transportation and marketing channels, financing, and other services are a strong inducement for smaller packing plants, not faced with the same problems as the giants of the industry, to take advantage of the huge and rapidly expanding market for high-grade cuts of meat which exists in the Chicago Area and in the whole urbanized region around southern Lake Michigan. Some of these packers may even use carcasses slaughtered elsewhere, but many will slaughter for their own special purposes. The likelihood of sharp increases in the demand for frozen and packaged complete meals and for other forms of quickly preparable dinners will stimulate the remaining meat packing groups.

The tremendous local market, a ready market for less expensive cuts in the expanding local sausage-packing industry, and the improved possibilities of shipping such cuts, as well as packaged meats, into foreign trade by refrigerated ships, makes it probable that the meat packing industry of Chicago has "bottomed-out." It is believed that smaller plants, concentrating on specialty meat lines, including very high quality fresh, frozen, and prepared types, will expand operations in the Area.

This expansion will not necessarily be the result of improved water transportation, but the possibility of moving into foreign trade the cuts and products that do not appeal to the discriminating metropolitan buyers will be an added incentive to locate near facilities for direct shipment. Primary markets for American meat and meat products exist in the Netherlands, Spain, Canada, and West Germany, all now economically more accessible from Chicago. As the European economy strengthens and higher living standards develop, this market should become more profitable for packers in a position to reach it.

Special Industry Machinery (355)

Industries included in this classification produce a great variety of special-purpose machines. Most of these are relatively limited geographically in their places of manufacture, and Chicago is one of the few areas where many of these machines are available. In addition, many of the machines are large and pose difficult problems of transportation. The prospect of easy and direct shipment of these bulky items to both foreign and United States

coastal markets as a result of the improved Seaway and Waterway will be of major benefit to this industry in Chicago. Rates on certain types of heavy machinery *via* ocean freighter are exactly the same by weight or volume to Western Europe direct from Chicago as they are from Atlantic ports. Thus rail charges otherwise incurred in reaching the East Coast are entirely saved. In 1957, savings on machinery shipped direct to Liverpool from Chicago, compared with shipment *via* New York were about $26 per long ton.

Basically the products of this industrial type include machines used in increasingly large numbers by all of the food industries, in woodworking, printing, papermaking, textile manufacturing, paint making, metal smelting and refining, glass making, chemical manufacture, and in many other relatively specialized manufacturing processes. Not quite enough special industry machinery is now produced in the area focusing on Chicago to supply the needs of industry there. The complex and varied machinery requirements of the Chicago Area alone would appear to provide sufficient incentive for a flourishing special machine industry. High labor costs have affected the industry in Chicago unfavorably, but the improved accessibility *via* the Waterway and Seaway to wider markets may offset this in the future.

GROWTH PROSPECT GROUP V

Industries which may *decline without reference* to improved water transportation

Industry Type and Standard Industrial Classification Number	Industry Group	Industrial Cost Pattern
Wood Furniture	Furniture and Fixtures	1
Textile House Furnishing Materials	Textile Mill Products	3
Spinning, Weaving and Dyeing of Cloth	Textile Mill Products	4
Special and Fabricated Textiles	Textile Mill Products	5
Lighting Fixtures	Fabricated Metal Products	6
Apparel	Apparel	6
Footwear	Leather and Leather Products	6
Aircraft and Parts	Transportation Equipment	6

In any industrial center constant change is the order of the day, and it is probably inevitable that some industries must decline in importance. Such decline may result either from changes in the industrial cost structure of the area or from local manifestations of national trends. In the case of the industries expected to decline in the Chicago Area without reference to improved water transportation, it is primarily the latter situation which is responsible.

The large-scale production of wood furniture has been steadily migrating to southeastern United States for several decades. Both the wood supplies and the relatively low-cost labor necessary for the industry are found there. Certain specialized types of wood furniture will continue to be made in the Chicago Area, but nowhere in the Manufacturing Belt is this industry expected to do more than hold its own in the future. Similarly, none of the major industrial cities of the Manufacturing Belt seem to retain any significant advantages for the manufacture of textiles. This industry, too, has steadily migrated to the southern Appalachian area until now that region completely dominates textile production in the United States. In these two types of industries, then, Chicago is simply sharing a decline felt, and to be felt, by all of the major northern industrial cities.

Chicago's importance in apparel and shoes was greatest in the days before the whole national market was truly accessible to a manufacturer of these items. During this early period Chicago functioned as a major regional supply center for these items. For many years, however, New York City has completely dominated the manufacturing of apparel, while shoe manufacturing has decentralized into low-wage areas.

The anticipated decline in the aircraft and parts industry is both part of a national trend and more apparent than real. As the dominant military market for aircraft has decreased with the advent of missiles, the aircraft industry has declined in many centers where it was formerly important. The decline in Chicago is more apparent than real because the diverse industries of the city manufacture many components both for aircraft and for the newer missiles which are not classified as parts of those industries. Many branches of the electrical machinery and fabricated metals industries, particularly, manufacture in Chicago products which will find their final use in either aircraft or missiles.

In most of these industries expected to decline in Chicago, then, the city is only experiencing the local impact of larger national trends. In certain others, the decline which is anticipated is merely a continuation of an already long-established declining trend. None of the anticipated declines reflect any basic shift in industrial locational patterns to Chicago's disfavor.

GROWTH PROSPECT GROUP VI

Industries which may *decline because of* improved water transportation

Industry Type and Standard Industrial Classification Number	Industry Group	Industrial Cost Pattern
Pottery and Related Products.....326	Stone, Clay and Glass Products 2	
Paving and Roofing Materials 295	Petroleum Refining and Related Industries 4	
Fabricated Wire Products.....348	Fabricated Metal Products 6	
Generators and Motors 3621	Electrical Machinery, Equipment and Supplies 6	
Hardware 3429	Fabricated Metal Products 6	
Cutlery 3421	Fabricated Metal Products 7	
Hand Tools 3423	Fabricated Metal Products 7	

The industries in this Group are those which seem particularly vulnerable to competition from similar goods brought into Chicago along one or both of the improved routes of water transportation. Most of the competition will come from imported goods, and these imports, initially at least, will probably come mostly from Western Europe. At some later time it seems likely that Japanese goods may also be imported directly *via* the Seaway; one Japanese shipping line has recently extended its service to Toronto, and others have declared their intentions to follow. In some of the industries in this Group, however, it seems likely that the major competition for Chicago manufacturers will come from other areas of the United States. In these cases it is likely that the improved Illinois Waterway will be the major route involved.

All of the industries in this Group (except paving and roofing materials) are types in which labor cost makes up a high proportion of total cost. Competition for these industries in the Chicago Area is expected to come largely from non-metropolitan areas in the United States or from foreign areas where labor costs are significantly lower. Competition is likely to be intensified in the pottery and the paving and roofing materials industries because these are particularly sensitive to transportation costs (Column 5 of Table V) and, therefore, will achieve the greatest savings through the increased availability of low-cost water transportation.

Within the industries in this Group there is a considerable variation in their present importance in the Chicago Area. Neither the pottery industry nor the paving and roofing materials industry is now a major segment of the economy of Chicago or of the Waterway area. These industries are now so little developed that they do not adequately meet the demands for their products in the region. The remaining industrial types all presently occupy an important place in the industrial structure of the region, and it is likely that they will continue to do so for some time in the future. They are vulnerable to competition from outside the Area, however, and seem likely to decline over the long run. It cannot be forecast at this time whether tariff levels on foreign goods of like type will be changed in such a fashion as to arrest the anticipated decline.

Pottery and Related Products (326)

Establishments in this industrial type manufacture a wide variety of products. Included are small items for direct consumption such as chinaware, flower pots, earthenware, vases, lamp bases, and kitchenware, as well as heavier and more specialized items such as house-

hold fixtures, industrial and laboratory ware, and chemical and electrical porcelain.

The Pottery industries have not been well developed in the Chicago Area, with fine chinaware and high grade earthenware products most conspicuously absent. A large part of the pottery industry of the Area has been concerned with the manufacture of vitreous plumbing fixtures. Even in this item, local demand has regularly exceeded production, and most of the Area's requirements have been supplied from outside.

This industry is sensitive to changes in transportation cost, or, stated another way, is one which benefits markedly from any reduction in transportation cost. Many of the products are relatively bulky per unit of weight, and all are non-perishable and so can use slower means of transportation. These characteristics of the industry and its products make low-cost water transportation an ideal medium for use.

Labor costs make up nearly 40 per cent of the delivered costs of the products in this group, and areas which have low labor costs and can take advantage of water transportation to reach the market will enjoy major competitive advantages. Within the United States, producers in the southern Mississippi Valley, shipping *via* the improved Illinois Waterway, are likely to enter the Chicago market even more than in the past. Overseas areas enjoying these competitive advantages and particularly noted for their pottery products include Great Britain, France, Germany, and Japan. All of these countries are already competing effectively in the United States pottery market, with West Germany alone sending in 1957 well over $1 million worth of china and earthenware products to the United States (25 per cent destined for the Midwest).

These areas of lower-cost production of pottery products will gain easier and cheaper access to the markets of the Midwest through the improved Seaway and Waterway. It is likely that the production of pottery in the Chicago Area, never adequate to supply the market, will further decline as a result of this competition.

Paving and Roofing Materials (295)

This industry is highly sensitive to transportation costs, and profit margins in the industry are relatively low. The products of the industry, such as asphalt paving block, creosoted wood, roofing felts, asphalt sidings, fabrics, board, and other roofing materials, are heavy and bulky in proportion to value, non-perishable, and well suited to shipment by waterborne carriers.

Two major requirements of the industry, although obtainable in Chicago, can be secured more cheaply elsewhere. The raw materials needed are asphalts and tars which are by-products of the petroleum or coking industries. These industries are highly developed in the Chicago Area, but the by-products may be obtained more cheaply in other places where fewer alternative uses for them exist. These materials are available at particularly low cost in the southern Mississippi Valley and along the Gulf Coast. Another raw material required—paper—is also available cheaply in these same areas. A second major requirement, labor (although not as high a proportion of the value of the product as some industries), is also relatively low in cost in the southern non-metropolitan areas.

Chicago manufacturers of paving and roofing materials find themselves in a difficult competitive position, even though the market for these products is large and growing. The additional ease and reduced cost of shipping along the improved Illinois Waterway seems likely to make these manufacturers even more vulnerable to competition from southern producers. No particular foreign competition is anticipated as a result of the improved Seaway, but the Waterway-aided competition may well lead to an eventual decline in the paving and roofing industry in the Chicago Area.

Fabricated Wire Products (348)

The products of this industry include nails, brads, staples, tacks, fencing, screens, cloth and netting, and a wide variety of other products made from rods, wire, and plate. By definition in the Standard Industrial Classification, only plants manufacturing wire products

from purchased materials are included. In the Chicago Area, however, most of the production of fabricated wire products occurs in steel mills or other plants producing their own rods and wire. Except as modified by differences resulting from this integrated ownership structure, the impact of improved water transportation will eventually be the same whether the raw material is made in the plant or purchased.

The fabricated wire products industry is presently well-developed in the Chicago Area and is closely associated with the primary iron and steel industry here. In the past, the industry in Chicago has produced in excess of local demand, and has supplied fabricated wire products to a large area of the Midwest.

In recent years, fabricated wire manufacturers in Western Europe have been supplying an increasingly large part of the United States' demand for high-quality wire products. They have been able to do this because of cheaper raw materials and lower labor costs in Europe, and because wire and nail products load heavily and ship well by water.

Competition from imported producers already has severely curtailed American manufacture of barbed wire and fencing, both heavily consumed in the Midwest. With the substantial benefit from the larger volume shipments into the Chicago Area made possible by the improved Seaway, European manufacturers anticipate increased sales in this Area. The increased capacity of the Illinois Waterway will make possible the further distribution of the heavy goods of this industry from Chicago docks to the upper Mississippi and lower Missouri Valleys. Unless higher tariffs are imposed or some other aspect of the situation changes radically, American and particularly Chicago manufacturers of fabricated wire products seem certain to face stiff import competition and probable declining markets.

Generators and Motors (3621)

Generators and motors are highly specialized products in which the cost of labor makes up a high proportion of the total cost of the finished article. These are items in which the design techniques are as far advanced in other industrial nations as they are in the United States. Germany and Great Britain in particular are known for their very efficient and high-quality generators and motors. In both of these countries, the cost of labor is very substantially below that prevailing anywhere in the United States, let alone in a major industrial area like Chicago.

In the recent past, generators and motors from European producing countries have been competing effectively in the American market. In some instances, they have been able even to overcome the considerable cost differentials required by the "Buy American" acts. With the improved access to the Midwest offered these large and heavy products by the improved St. Lawrence Seaway, it seems certain that German and British producers will compete even more effectively in the future. Unless there are major changes in tariffs or in defense-inspired regulations in the future, this industry seems likely to decline in the Chicago Area as in the rest of the United States.

Cutlery, Hand Tools and Hardware (3421, 3423, 3429)

Although including a great variety of cutting instruments and tools, the cutlery and hand tool industrial types have many common locational requirements and may suffer a decline in the Chicago Area for the same reason—competition from overseas manufacturers. English and German craftsmen, particularly, long have been noted for the high quality of their products and are able to produce these items more cheaply than is possible in the United States.

Cutlery manufacture (including tableware, scissors, clippers, knives, cleavers, razors, and blades) has a somewhat higher labor requirement than does the production of hand tools, and may be at a distance from producers of their materials. Nevertheless, the manufacture of tools, such as axes, planes, hammers, screwdrivers, shovels, rakes, and dies for cutting paper, leather, or cloth also requires high payroll expenditure, and material needs are not high. Both industries obtain real advantage from low labor costs.

The products of these industries are readily shipped by water — being non-perishable, heavy, compact, and easily packed and handled. These relatively high value general cargo items are already shipped to the United States in large quantity, and this situation is expected to continue and the volume to increase.

The hardware industry differs only slightly in its locational requirements from the cutlery and hand tool industries. It is somewhat less sensitive to labor costs, and slightly more dependent upon sources of materials. Locks and other builders' hardware, hardware for furniture, trunks and suitcases, padlocks, and a long list of other such items are included. Much that was said concerning cutlery and hand tools applies to the hardware industry except that foreign competition has not been as severe in the past. It is anticipated, however, that overseas producers of these small items, able to manufacture at low cost, will make strenuous efforts to take advantage of trade-channels in the hardware business that have been opened by cutlery and tools. By July 8, in the 1959 shipping season, tools and basic hardware, at 10,731 short tons, were second only to steel as imported items at the Port of Chicago.[1] This indicates the importance being attached to the improved Seaway by overseas manufacturers.

[1]Estimated from cargo listings in *Journal of Commerce: Import Bulletin.*

The Employment Impact of Waterway Improvement

The preceding individual industrial discussions—and the classification of those industries into the several Growth Prospect Groups —make clear that the impact of improved water transportation will be neither uniformly felt nor universally beneficial. The total impact of Seaway and Waterway improvements upon the 1965 economic structure of Chicago will be minor in contrast both to the employment growth implied by the Area's presently developed growth trends and to the longer-run possibilities of expansion attributable indirectly to the increased capacity of both water routes. The terminal date of our estimates—1965—is undoubtedly too near at hand to permit by then the full development of the employment impacts inherent in the improvement of major transportation arteries. By that date, only modest increments in employment in either manufacturing or non-manufacturing attributable to waterway improvement will be apparent. Compared to an anticipated expansion of nearly 270,000 in Area employment by 1965 as the consequence of already expressed growth trends, waterway development will add an estimated 38,000.

Employment increments by 1965 attributable solely to water transportation developments will not, of course, be distributed uniformly among the different activity groups of the Area. The Growth Prospect Group summarizations have already suggested the pattern of benefits; the positive employment impacts, as modifications of predicted 1965 employment volumes, are summarized in Table VI. For no activity group, where possibilities of individual industry declines were suggested, was adverse waterway impact seen as sufficient by 1965 to lower earlier employment volume estimates.

TABLE VI

EMPLOYMENT IMPACT OF WATERWAY IMPROVEMENT: CHICAGO STANDARD METROPOLITAN AREA, 1965

Activity Group	Predicted 1965 Employment (From Tables II & III)	Predicted Waterway Employment Increment	Total 1965 Employment Estimate
MANUFACTURING			
Foods	91,000	1,500	92,500
Textiles	5,000	—	5,000
Apparel	27,000	—	27,000
Wood Products	10,000	—	10,000
Furniture	24,500	—	24,500
Paper	27,000	750	27,750
Printing	87,000	—	87,000
Chemicals	42,000	1,250	43,250
Petroleum	16,000	—	16,000
Rubber	5,500	—	5,500
Leather	8,000	500	8,500
Stone, Clay, Glass	21,000	1,250	22,250
Primary Metals	145,000	2,500	147,500
Fabricated Metals	118,500	—	118,500
Non-electrical Machinery	154,000	250	154,250
Electrical Machinery	147,500	—	147,500
Transportation Equipment	55,000	—	55,000
Instruments	32,000	—	32,000
Miscellaneous	50,000	—	50,000
NON-MANUFACTURING			
Mining	3,300	—	3,300
Construction	160,000	3,500	163,500
Railroad and Bus	70,500	1,000	71,500
Other Transportation	88,000	3,500	91,500
Public Utilities (Including Communication)	67,000	1,000	68,000
Wholesale Trade	201,500	3,750	205,250
Retail Trade	380,000	5,000	385,000
Finance, Insurance, Real Estate	165,000	3,000	168,000
Service and Miscellaneous	395,000	5,250	400,250
Government	269,000	4,000	273,000
Totals	2,865,300	38,000	2,903,300

PART IV

SUMMARY OF FINDINGS

The general assessments of Seaway and Waterway impact have grown out of a series of specific findings, the results of the research undertaken for this study. The more important of those findings are summarized below. These include the major conclusions reached regarding Chicago's development and "normal" growth, as well as those dealing specifically with the Seaway. Most economic change in Chicago in the near future will follow the lines indicated by the established trends of her past growth. Each of the findings is followed by a parenthetical reference to the pages of this report where the necessary supporting evidence may be found.

1. By 1919, essentially Chicago's present pattern of industrial organization and importance had been established. (pp. 6 to 9)

2. The World War II and postwar period has brought an increasing emphasis on metals and machinery manufacture, and a significant relative decline in the importance of food processing, furniture, and apparel. (pp. 10 and 11)

3. For the past 30 years, total industrial employment growth in the Area has kept pace with national rates of expansion; in 1957, as in 1920, the Chicago Area contained over 6 per cent of the nation's manufacturing employment. (p. 11)

4. Contemporary Chicago displays a strong industrial specialization supported by a wide range of smaller diversified activities. Four industrial groups contain more than one-half of the manufacturing employment of the Area, but elements of all 20 two-digit groups are represented. (pp. 11 to 14)

5. The Waterway-associated area shows a distinct pattern of industrial concentration. Two widely separated areas contain more than 80 per cent of manufacturing employment in the nineteen-country district. (pp. 14 and 15)

6. These same Waterway concentrations exhibit a high degree of industrial specialization. Eighty per cent of all industrial workers find employment in only five industry groups. (pp. 15 and 16)

7. On the basis of employment, non-manufacturing activities dominate the economic structure of Chicago and will grow even more dominant by 1965. (pp. 18 and 19)

8. By 1965, existing growth trends will increase the Area's total employment by 270,000 workers. Non-manufacturing employment will grow at a rate more than twice as fast as that of manufacturing. (pp. 18 and 22)

9. By 1965, Chicago's manufacturing structure will show an even increased emphasis on producers and durable goods production. (pp. 19 and 20)

10. Present employment growth trends in Chicago Area manufacturing will expand the industrial labor force by 6 per cent between 1957 and 1965; numerical increases will be unevenly distributed between industry groups. (Table II and pp. 23 to 30)

11. Present employment growth trends in Chicago Area non-manufacturing activities will expand the service industries' labor force by 13 per cent between 1957 and 1965; numerical increases will be unevenly distributed between non-manufacturing activity groups. (Table III and pp. 31 and 32)

12. Present employment growth trends in the Waterway-associated area will expand the industrial labor force there by 10 per cent between 1957 and 1965. (p. 33)

13. The improved St. Lawrence Seaway will, by 1965, add the capacity to move an absolute maximum of just over 6,000,000 additional tons of *industrially significant* materials and products into and out of the Chicago Area. (Table IV and pp. 37 to 40)

14. About one-third of all of Chicago's new tonnage may be general cargo; that would represent an increase of 600 per cent over the 1957 overseas general cargo traffic of the Port. (Table IV and p. 40)

15. The improved St. Lawrence Seaway will improve the industrial attractiveness of the Chicago Area, create new patterns of market possibilities, and give rise to a new transportation-cost structure. (pp. 41 to 44)

16. Existing Chicago industries vary widely in the critical cost items which affect their successful operation. The ability of the Chicago Area to satisfy the major location requirements of present industries is summarized in a series of seven Industrial Cost Patterns. (Table V and pp. 44 to 53)

17. The growth prospects of Chicago industries will be differentially affected by waterway improvement. Of nearly one hundred industrial types considered, 21 may have an existing growth trend accelerated by improved water transportation, five may benefit through reversal of an existing trend toward decline, and seven may be adversely affected by waterway improvement. (pp. 54 to 80)

18. The net increment in Chicago Area employment attributable solely to Seaway and Waterway improvement by 1965 will amount to 38,000 workers. (pp. 80 and 81)

APPENDIX A

Freight Rates

This Appendix surveys briefly present practices and indicated possible trends in rate-making in the transportation industries, with particular emphasis on the problems that the opening of the improved St. Lawrence Seaway has imposed on the carriers serving Chicago. It will illustrate the extreme difficulty of making predictions about the future structure of freight rates.

The primary bases of traditional rate-making in the United States are: (1) distance; (2) value; (3) volume. Most rates reflect, in one way or another, the distance goods are carried, their value, and the size of shipments. However, great variations in the application of these traditional principles over the 130 years of rate-making have resulted in a very complex rate structure in this country. Most of this complexity is a result of the rise of particular rates or, as they are more commonly known, of commodity rates. These are rates established on a particular commodity for movement between particular points, rate territories, or rate areas. By 1942, over 85 per cent of the traffic in this country was moving on commodity rates. By 1947, 95 per cent moved on such rates, and in 1959 it is estimated that 96 per cent of all the tonnage within this country was moved under commodity rates.

Another set of rates, of extreme importance to Chicago in the future, are export and import rates. These are special rates which are applied to commodities which move directly from their source to a port for loading to overseas destinations, or which are unloaded from overseas originations to be shipped directly to a market. Export and import rates are lower than domestic rates and can be used to enhance the competitive advantage of a carrier or of a particular port. There are many other kinds of rates in existence, but by far the most common is the commodity rate described above.

Since there are over 5,000 different commodities moving on commodity rates and over 34,000 points between which these commodities are moved, the possible tariffs in this country could reach an almost incomprehensible number. It is estimated that there are in existence 500,000 railroad tariffs and supplements, from one to 1,200 pages in length, containing tens of millions of rates. Thus, even with a stable rate structure, it is very difficult to generalize on rates applicable to particular commodities from and to particular places.

The situation is complicated further because the outstanding characteristic of the rate situation at the present is its state of flux. Freight rates on many commodities are very unstable, and it is impossible to predict with surety what they will be in the future. However, it is possible to cite examples of rate-making now and to make some broad assumptions of general rate levels in the future with particular reference to the position of Chicago.

1. Freight rates in the Seaway's competitive area will be reduced drastically on certain commodities. An example of such a reduction is the recent 20 to 25 per cent reduction of export rates by the railroads on grain from the Midwest to the East Coast. The eastern railroads also have proposed rate reductions on an expanded list of commodities. The proposed reductions range from 10 per cent to 25 per cent, and would be applied to export and import rates. Commodities included in the list are lard, tallow and grease, agricultural implements, canned goods, automobiles and trucks, chinaware and crockery, ammonium nitrate, and canned meat and fish.

2. The general level of freight rates will decrease due to inter-agency competition. Some examples of this are the export grain rates offered by the eastern railroads as a result of rail and ocean carrier competition, and proposed export grain rate reduction offered by the western railroads to meet the truck competition to the Great Lakes. Another proposal is one made by the Soo Line to offer contract rates on wrought iron pipe and tubing from Sault Ste. Marie to Chicago. This proposal would reduce rates by 17½ per cent to the shipper who moved at least 90 per cent of his shipments over the Soo Line. This rate change is designed to meet competition from lake shipping, but in April, 1959, it was suspended for seven months by the Interstate Commerce Commission.

3. Because of lowered transportation costs relative to increases in other industrial costs, the cost of accumulation and distribution of materials and products will be lowered relative to other industrial costs. This general relative reduction of costs will probably hold for many areas in addition to those directly accessible to the Seaway.

4. Completion of the Calumet-Sag Channel will increase rate competition in the area served by that Waterway.

Because actual rates are so unstable at the present time, it is not useful to cite examples of costs pertaining to Seaway and rail charges. More pertinent is a consideration of trends in rate structure, i.e. the *system* of freight rates, applicable to all situations, and based on certain overriding principles. The rate structure involves rate relationships and thus contrasts with levels of rates which apply to particular commodities.

There are two types of rate structure which show signs of becoming more important in the future. The first is one based on volume density and mileage factors; at present, truckers in New England are using this sort of rate structure. Freight rates under this system tend to be reduced to the level of the cost of carrying the freight plus a reasonable rate of return. It is one under which revenues from carrying freight tend to be stabilized, since it is designed to provide the same rate of revenue for each truckload regardless of the commodity carried. Rates are made according to the volume which the goods occupy, the weight contained in that volume, and the distance over which the goods are carried. Another example of this sort of rate-making is the carrying of highway trailers on railroad flatcars ("piggy-back") in those cases where flat distance rates on the trailers are offered regardless of contents. This sort of rate-making is a very significant departure from the traditional railroad system of making rates according to the commodity carried, as it is the normal practice to charge higher rates for finished products than for raw or semi-finished materials.

One very important effect of this rate structure on the shippers is that it practically eliminates rate discrimination based on value of goods. It means that the historic market relationships which developed under the traditional railroad rate-making practices are destroyed. The length of the haul becomes the most important determinant of the rate. Rates vary little from one commodity to another except as the actual cost of carrying the commodity differs.

One type of shipper who would be very much affected by this sort of rate structure is one engaged in a manufacturing process which involves a weight or bulk loss during the conversion of materials into product. It would be to his interest to reduce the distance his raw materials must be carried, because the increased distance which the finished product must be carried would no longer be as significant as it has been under the discriminatory rates.

The second type of rate structure forseen from developments in current rate practices is one based on joint rates and through rates. This would be possible in an integrated transport system, or at least a coordinated one. It would also very likely involve a greatly increased use of special equipment in order to handle freight more efficiently. Under this system a shipper might have his commodities carried by three or even four different carriers, but he would be given just one bill of lading

and would be quoted one through rate. Each carrier would be carrying the commodity for the part of the haul for which he was best suited.

There are some examples of this at the present time. The striking increase in "piggy-back" practice illustrates the fact that shippers are taking advantage of the flexibility of trucks and their ability to pick up and deliver door-to-door, plus the greater economy over the long haul by rail. An added advantage of this practice is the reduction of loss and damage suffered to the commodity while it is enroute, since it remains in the original container for the whole trip. Illustrating the increasing popularity of this system is the fact that from January to June 1959 there was a 61 per cent increase in "piggy-back" carloading over the same period in 1958. Another example of this type of containerization is one in which truck-trailer bodies are carried by rail and by water. There is a regular service known as Sea Train operating between New York and New Orleans, for example, in addition to certain other Atlantic and Gulf ports.

Obviously, under this type of rate structure the transportation companies would find it desirable to actually own more than one carrier, such as railroads owning a truck firm. At present, this is prevented by the Interstate Commerce Act, which prohibits one transportation company from acquiring control over another.

A joint and through rate structure, which involves a great deal of coordination and the use of special equipment, would result in the greatest savings where volume is great and the facilities for freight handling are excellent. This means that places like Chicago will be able to profit most from savings accruing from this rate structure.

There is an apparent awareness on the part of all carriers that intense competition will be necessary in the period ahead in order to gain or even retain traffic. Most carriers are being aggressive in improving service and lowering costs. Receiving particularly strong emphasis is freight containerization, but all aspects of service are being appraised and re-appraised by carriers in all media.

APPENDIX B

Statistical Techniques

This study was undertaken to answer specific questions within a limited time. It was, therefore, neither desirable nor possible to experiment with any new or unusual statistical techniques. In this, as in any study, however, there are limitations and qualifications imposed upon the techniques used. It is to make clear our application and modification of certain standard statistical devices that this Appendix is included.

I. 1965 Employment Predictions

Detailed conclusions reached in this report concerning the impact of improving water transportation reflect our conviction that only a slight modification of the already growing and changing economic structure of the Chicago Standard Metropolitan Area can occur. Our conclusions were dependent in large measure, therefore, upon prior estimation of normal changes in the economy of the Area logically to be expected by 1965. To estimate those changes it was necessary to use the methodology of economic forecasting. Techniques available for such forecasts range from purely subjective estimates to very elaborate techniques which require so much time for computation that the forecasts themselves may be overtaken by the actual events. We rejected the former as improper, and the later as impossible within the time limit granted us.

As a middle ground of approach—combining the two necessary attributes of reasonable objectivity and quick computation—preliminary 1965 estimates were made on the basis of calculated projections of available time series. Initially, a number of different types of computed curves were fitted to the employment data series, but the more sophisticated trend curves either fitted no better or offered a poorer basis for projection than those resulting from linear least squares extensions. These least squares projections, then, were used as the starting point for the ultimate 1965 employment predictions.

In order to analyze in as much detail as possible the separate sectors of Chicago's economy, and to detect the sometimes widely divergent trends in individual manufacturing and non-manufacturing industries, no reliance was placed upon projections of the total labor force. Rather, projections were made on the basis of data pertaining to individual activity groups.

No single series of data was available which adequately covered all sectors of the economy. Instead, a considerable number and variety of sources had to be utilized in order to accumulate even minimal data. As accumulated, these data were not consistent for both the manufacturing and non-manufacturing sectors in length of run or in initial or terminal date.

Longest runs were available for manufacturing industry groups. Projections for these to 1965 were made on data series running from 1947 to 1957. The series was started with the first post-war year available, 1947, for several reasons. First, data for 1939—which were available—were not consistent with the 1947 and later industrial classifications; nearly insoluble problems of reconciliation developed when 1939 data were fitted into the series. Second, since no data were available for the period between 1939 and 1947, such an extended gap in the series implied inaccuracies in fitting trend lines. Third, the rapid development and growth of the American (and Chicago's) manufacturing economy during the war years resulted in a major differential in the volume of employment between the two years; that differential adversely affected the predictive value of the slope of trend lines fitted to data running back to 1939. Fourth, it was felt that only the post-war years displayed industrial trends which were likely to be meaningful for 1965 estimates; basic

changes in many phases of America's economy —rise of new products and decline of old, introduction of new techniques, changes in traditional levels of productivity, and changes in the manner and level of living—meant that 1939 data were no longer meaningful in the contemporary scene. Therefore, only a postwar series was employed.

No single source contained manufacturing employment statistics for the entire period of concern. Instead, data for the 1947-1957 industry group series for the Chicago Standard Metropolitan Area were drawn from three different but essentially comparable sources. Primary were the detailed three-and four-digit metropolitan area industry statistics from the *1954 Census of Manufactures*. As perhaps the most detailed and accurate recent industrial census available, this was considered as a basic "datum plane" against which all other available figures could be evaluated for completeness and likely comparability. The nearly equally useful *1947 Census of Manufactures* was used as the source of data for the initial point of the statistical series. Unfortunately, the *1958 Census of Manufactures* was not yet available as a terminal check. Intervening years within the 1947-1957 series were taken, when possible, from the very excellent county statistics of the *County Business Patterns*. Less complete in three- and four-digit reports than the *Census of Manufactures*, the *County Business Patterns* series nevertheless provided accurate reports for several of the years for at least two-digit industry group employment figures. For recent years—except 1956, for which a *County Business Patterns* was available—we were forced to rely on metropolitan area two-digit estimates published in the *Annual Survey of Manufactures* of the Bureau of the Census.

For the non-manufacturing sector of Chicago's economy, a special problem emerged: to find any kind of reasonably detailed statistical series which had been published for a long enough period to provide the basis for detecting a genuine trend. Non-manufacturing statistics were taken from the Illinois Department of Labor and Bureau of Labor Statistics series *Estimates of Employment, Hours, and Earnings: Chicago Metropolitan Area,* which provided monthly estimates for the study Area from 1952 to 1958. Unfortunately, this series could not be supplemented—as the manufacturing data were—by figures from *County Business Patterns*. Although non-manufacturing data are included in *County Business Patterns,* they were non-comparable with the longer basic series by reason of omission of several major categories of non-manufacturing employment, including railroad and governmental employees not covered by the Old Age and Survivors Insurance program. It is recognized that the length of series used for non-manufacturing projections was shorter than desirable, but it included all the comparable detailed data available, and for most activities a reasonably clear trend seemed established.

Projections of the ten year (for manufacturing) and six year (for non-manufacturing) trends yielded 1965 employment level predictions. The predictions were not, however, uncritically accepted. Rather, each was subjected to a searching evaluation designed to assure that each final employment estimate reflected not only the long-term trend but also whatever modifications seemed mandatory in the light of other knowledge. The modifications —where found to be necessary—resulted from one or several of the following lines of analytical reasoning.

1. Trend lines were calculated for each activity group for the United States as a whole. The national experience, particularly for recent years, and the national trend were compared to the experience and trend of Chicago. Where the experience had been strikingly different or the projections were at sharp variance, the Chicago estimate was re-examined to test the possibility that Chicago's future development might more nearly resemble the national trend.

2. We were advised by several economists who have made long and detailed studies of the Chicago Area that the metropolitan area could at best expect in 1965 to have about its present share of United States employment in the different activity groups. Therefore, Chicago's average 1954-1956 share of United States employment in

each group was calculated, and this was compared with the percentage Chicago would have in 1965 if the trend projections for both Chicago and the United States were to prevail. This estimate of Chicago's future activity seemed to us too pessimistic for at least some of the activity groups; this viewpoint was, therefore, considered as suggestive rather than determinative in estimate modification.

3. The experiences of recent years in employment volume were considered significant if they varied substantially from the long-run trend lines and if the variations were known to have been due to factors likely to persist.

4. Recent investments in the different industrial groups and types were reviewed to determine the effect of the resulting new capacity on the growth trends of those industries.

5. Announced plans for future new investment, expansion, and plant closings were carefully reviewed to estimate the effect of such proposals on the 1965 manufacturing employment in the Metropolitan Area.

6. In the light of recent experience, a fairly high rate of gain in productivity was assumed.

7. We consulted as many people as possible who were well informed about particular industries to get their forecasts as to the probable future of those industries in the Chicago Area.

8. We studied the probable impact on Chicago employment of general predictions about the level of economic activity in the years to 1965.

After all these influences and sources of information were studied, we accepted or modified the employment projections resulting from the initial trend analysis. In a large majority of cases, the modification was to increase the trend-projected figure. In each such case this was justified by information available to us; more generally, it also reflected Chicago's dynamic industrial history and recent spectacular investment record. It must be emphasized that the final estimates are the sole responsibility of the authors of this report and should be attributed neither to those who provided information nor to the sponsoring agencies.

II. "Population Served" Technique

Very large concentrations of population such as the Chicago Standard Metropolitan Area are both consumers and suppliers of goods. For many items, of course, both supply and consumption take place within the area itself. For other items, the area may draw on production from outside its boundaries or, more important for its economic prosperity, it may serve people beyond its own boundaries. A calculation of the population served by each of the manufacturing industries of the Chicago Metropolitan Area is an attempt to identify those industries which are so well developed as to serve a wider than local market, and to recognize those so little developed as not to meet the Area's own needs. The technique used is as follows:

1. The number of workers engaged in each of the two- and three-digit industry classifications in the United States was determined from the *1956 County Business Patterns.* (All data, including population, refer to 1956.) By dividing the population of the United States by the number engaged in each industry, it was possible to calculate the number of inhabitants served by each employee in each of the industry groups and types. The figures derived from this calculation were used as a basis for the evaluation in the Chicago Area.

2. For each of the two- and three-digit industry groups, the number of manufacturing employees in the Chicago Standard Metropolitan Area was multiplied by the corresponding "population-per-employee" figure, calculated in the first step, in order to determine the total population which was served by each industry of the Area. In those instances where the population served by the workers in a particular industry group was roughly equal to the pop-

ulation living within the Chicago Area, the industry was assumed to be adequately supplying an essentially local market, and no further attention was given it in this particular analysis.

3. In some cases it was found that the employees in a particular industry in the Chicago Area were serving a population far greater than that of the Area itself. This was taken as an indication of specialization in this industrial activity within the Area, and these industry groups were examined with a view toward the possibility of a further increase in the specialization which had grown out of Chicago's particular advantages.

4. In some cases an industry group was found to be underdeveloped—that is, the number of employees in that industry were not sufficient to serve the population of the Chicago Area. The degree of underdevelopment may be determined by subtracting the population now served by the industry from the total population of the Area. This unserved population may constitute an "expansion potential" for that particular industry: that is, an Area population that is now served by outside industry but which could provide a local market for additional industry of this type within the Area itself.

Although the data used for this study referred to 1956, they remain valid in their essentials for the present time. It is unlikely, over a short span of time, that there will be a sufficient change in productivity to affect greatly the calculations of "population served." It would, of course, have been more desirable to use 1957 data, since many of our other materials were of that date. However, the latest information available in sufficient detail for the "population served" calculation date from 1956, and the divergence in that single year is not so great as to vitiate the conclusions.

It must be understood, of course, that not all of the underdeveloped industries identified by these calculations have a real expansion potential within the Chicago Area. Such a statistical calculation cannot reveal which industries are underdeveloped because of real disadvantages to their operation in the Chicago Area; nor can it identify those which, although still underdeveloped, are rapidly growing in the Area. It must be further recognized that because of the diversity of requirements for profitable operation of particular types of industry, not all those calculated to have an expansion potential will realize growth as a result of the improved water transportation available.

A separate calculation was made from the *1954 Census of Manufactures* for the entire Chicago Supporting Area of Freight Rate and Shipping Advantage (Fig. 8). The results are presented in summary in Columns 7 and 8 of Table V, and will appear in full in Volume II of this report.

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